MEMORANDUM

INTERMOUNTAIN POWER SERVICE CORPORATION

TO: Jon Finlinson

FROM: Dennis K. Killian

DATE: December 28, 2005

SUBJECT: Temporary Operating Procedure for Alstom ID Fan Variable Drive Cooling Systems During Cold Weather

The condensers on the roof of the scrubber can trip in sub-zero temperatures. If the condensers trip, the ID fan variable frequency drives will eventually alarm and then trip on high coolant temperature. If you receive a coolant temperature alarm, on any of the new ID fan drives, the AQCS operator should:

1. Verify the alarm is caused by a rising coolant (DI water) temperature using the HMI screen on the front of the drive.

2. Proceed to the AQCS HVAC room and open the four (4) valves (see attached drawing 2SCB-M2057C).

   a. 2SCB-BV-109
   b. 2SCB-BV-111
   c. 2SCB-BV-300
   d. 2SCB-BV-314

3. Go back to the ID fan drive and verify that the coolant temperature is decreasing.

There are projects scheduled to prevent the condensers from tripping in extremely cold weather. The Unit 2 condensers will be modified in April 2006 and the Unit 1 condensers will be modified in April 2007. Until the modifications have been completed you should follow the above procedure.

If you have any questions or require additional information please contact Nathan Crop at ext. 6483.

NRC/JPC:jmj

Attachments

INTERMOUNTAIN POWER SERVICE CORPORATION

CAPITAL PROJECT IGS02-07

W.O. # 02-53663 Date July 25, 2003

PROJECT APPROVAL	Title ID Fan Variable Frequency Drives Budget Source: Approved Capital Superintendent Technical Services Signed: _____ Dated: _____ IPSC Pres. & COO Approval Signed: _____ Dated: _____ Route: 1. Package to Operations for approval to proceed (signature below) 2. Requisitions and copy of signed approval form to Purchasing
PROJECT INFORMATION	IPSC Contact Jon P. Christensen Ext. 6481 Total Est. Costs: $9,735,000 Scheduled Start: Feb 2004 Total cost this year $1,280,000 (Mtl. $ 1,225,000 Labor $ 50,000 Engring. $ 5,000)
INSTALLATION	Preconstruction Appvl (Oper.) _____ Date _____ Tagging 'CONSTRUCTION' update _____ Date _____ Work Pkg. to Planning (Engr.) _____ Date _____ QA/QC Completion (QA/QC Engr. _____ Date _____ Startup Complete (IPSC Engr.) _____ Date _____ Install. Complete (Planner) _____ Date _____ As-Built Pkg to Engr. (Planner) _____ Date _____ Released to Oper. (IPSC Engr.) _____ Date _____
PROJECT CLOSEOUT	Closeout Complete (IPSC Engr.) _____ Date _____ Tagging 'AS-BUILT' update _____ Date _____ Project Complete (GWC) _____ Date _____

ID Fan Drive Replacement (1A1, 1A2, 1B1, 1B2, 1C1 and 1C2).
IGS02-07
March 22, 2006

Project Overview

We are replacing six (6) induced draft fan variable frequency drives on unit two (2). Both the variable frequency drives for the ID fan 1D were changed out in March 2004. After the April 2006 outage operations will have all new Alstom ID Fan Drives.

The replacement of these six (6) drives is broken down below:

1. Extraction of the ID fan drives (April 1st and 2nd).
2. Installation of the new drives (April 3rd and 4th).
3. Modification of the six (6) 6.9kV feeder breaker cubicle wiring. This involves adding a high speed relay that will tell the drive to stop firing thyristors as soon as the 6.9KV feeder breaker is tripping.
4. Modification of the modicon code (Ladder logic). We do this to make the new drives transparent for the controlling procedures well known to the unit operator.
5. Physical and electrical installation of the six (6) new drives.
6. Wire verification and low and medium voltage power up (April 5th - 9th).
7. Input and output verification 48 points per channel * six (6) drives equal 288 points. 288 I/O points to verify (April 5th - 9th).
8. High voltage cable verification and high voltage power up (April 10th).
9. Baseline testing and initial rotation of ID fan motors. The inlet dampers will be closed for this (April 15th -20th).
10. Full load testing of ID fan drives in both six (6) and twelve pulse mode. This will be mid-nite and draft will be applied through boiler (April 21st - 27th).
11. Handing over ID fan 1B and 1C to operations April 24th.
12. Hand over ID fan 1A to operations April 28th.

Major Difference with new drives:

1. The new drives will now be dependent on chilled water flow in the scrubber for cooling. Engineering package IGS04-04 has detailed the provisions made to guarantee a reliable fully redundant control arrangement for this cooling source.
2. A shaft position encoder has been installed in the exciter motor housing of every ID fan.
3. The breaker trip panel has been replaced with a hard wire trip circuit from the 6.9KV feeder breaker.
4. The motor/drive disconnect is now automatically closed upon turning on of the ID fan.
5. A new human machine interface located on each individual ID fan drive channel replaces the old ID fan annunciator.

Special Needs Throughout the Outage Month of April 2006.

1. R.A.T. will need to be available before the 10th of April for our testing.
2. Need the de-mineralized water line on to the unit 2 scrubber air handler room (Second floor).
3. Mid-night shift from April 21st - 30th for applying full draft to boiler.
4. Full clearance on 1A, 1B and 1C ID fan drives starting on April 1st.
5. Delta ID fan drive will be controlled locally for the first week of April.
6. Permission to run the ID fans with the inlet dampers closed for initial rotational checks (Half speed or less).

Startup/Operation procedures:

Operationally there will be no change in controlling the new ID fan drives from the unit control room. The reset button on the front of the drives regulator cabinet should be pushed to clear any alarms before re-starting a drive. The AQCS operator will now only have to push reset and then stand back as the unit operator gives the ID fan a start.

Note: If the drive is out of service for more than an hour the reset button should be pushed and then the operator should wait for the water pumps to run. Letting the pumps run for up to an hour will bring the conductivity of the internal water down to normal operating level.

Maintenance procedures:

1. Six (6) months after initial installation the water cooling system connections need re-tightening.
2. Regular inspection of all electrical connections is required. Inspection of cooling system duct work is now essential as well.
3. All regular preventative maintenance on motors and housing will still be observed.

Detailed Description of Changes

1. Digital Control System

The new control system is based on a SIGMA controller installed in each channel regulator cabinet. The SIGMA can be accessed, by using a laptop computer, and connecting to the RS232 port on the front of the drive cabinet. The SIMGA program will be finalized during the drive commissioning. Final copies of the program will be kept in the Electrical Shop.

2. Drive Cooling System

New lines and isolation valves have been installed from the existing building chilled water system to each channel cooling system cabinet. These lines and valves are shown

on drawing 2SCB-M2057C. The external water supply provides cooling through a heat exchanger mounted in the cooling water cabinet.

The internal channel cooling system is closed loop system with 25 gallons of de-ionized water which is treated to reduce the water conductivity. The system has fully redundant pumps. The complete cooling system is shown on Alstom drawings 2001-101 through 106.

The cooling system is controlled by a programmable logic controller (PLC) and a local panel provides flow, conductivity, and temperature indication. Indicating lights are provided for Cooling System Healthy, Cooling System Trip, Cooling System Alarm, Pump 1 Running, Pump 2 Running, Pump Failure, High Temperature, Coolant Conductivity, Reservoir Level and Moisture Detected. The alarms and trip signals are sent as a single common alarm or trip to the Sequence of Events System.

The local control panels also provides a two position selector switch (SW1) to select automatic or manual operation of the pumps and a three position selector switch (SW2) to select pump 1, off, or pump 2 when in manual operation. Normally the pump control switch should be in the automatic position.

The mixed bed de-ionizer is automatically placed in a slipstream off of the water circuit when the conductivity exceeds 0.5μS. If the conductivity remains above 0.5μS for more than 30 minutes a conductivity alarm is sent. If a conductivity alarm is received, the mixed bed de-ionizer should be replaced. The de-ionizer can be replaced without removing the channel from service. The channel trips if the conductivity exceeds 1.0 μS.

The cooling water system alarms if the water temperature reaches 55 C and trips if the temperature reaches 60 C.

3. Motor Shaft Encoder

An encoder has been mounted on the motor shaft to provide indication of motor shaft with respect to motor phase voltages. The encoder consists of a four lobed split aluminum ring clamped to the motor shaft and six proximity switches. This encoder is required for starting and low speed operation.

4. Breaker Trip Panel

The circuits for the Unit 2 'D' ID Fan have been removed from the breaker trip panel. Each individual drive link provides a direct (from the drive to the 6900 volt breaker) trip circuit and a redundant trip circuit through the Modicon. Drive trips and individual alarms are annunciated locally at the link HMI. A drive tripped and common trouble alarm is also annunciated at the ABB Sequence of Events (SOE) in the unit control room.

5. Human Machine Interface (HMI)

Each link has been provided with a HMI. The HMI includes a touch screen which provides a system overview, local metering (in both digital and analog formats), alarm recorder and digital & analog I/O status. A copy of the system overview is attached.

6. Motor Operated Isolated Switch

The contactor/isolation switch has been replaced with a motor driven load break switch. The new motor operated switch is controlled by the drive and not by a local run/off switch. It has been designed to allow the link to be isolated from the motor for link maintenance but is to be in service during normal operation. When the link 6900 volt circuit breaker is closed and the link is given run command the link will automatically close its isolation switch.

The isolation switch will automatically be opened when the link 6900 volt circuit breaker is opened. The switch can be locked in the open position by using a key interlock system. When performing maintenance the switch should always be isolated both electrically and mechanically.

7. Control and Indication Circuits

All control and indication circuits have been changed to 4-20 mA current circuits instead of a mixture of current and voltage circuits. The speed control circuits, from the CCS system remain 4-20 mA but have been split so a separate control circuit is supplied to each link. The feedback control circuit to the CCs system is still a 4-20 mA circuit supplied by the master link.

The indication circuits to the control desk and the PI system have been changed from voltage circuits to current circuits. These circuits represent motor voltage and current.

8. Speed Indication

In the existing systems the motor shaft mounted toothed wheel provides speed indication to the PI system and the drive provides speed indication to the CCS. After drive installation all speed indication will come from the drive.

CACHE VALLEY ELECTRIC CO.
P.O. BOX 405
LOGAN, UTAH 84323
BILLING QUESTIONS (801) 908-6666

To: Intermountain Power Services
850 W. Brush Wellman Rd.

Delta, UT 84624

Invoice: 21 - 57364

Date: 6/20/2007

Application #: 1

Contract: 10478- IPS Power Fan Shut Down

Item	Description	Contract Amount	Total Completed To Date	%	Previous Amount Billed	Amount This Period
1	IPS Power Fan Shut Down	85,058.00	85,058.00	100.00%	0.00	85,058.00
9001	A-Core Work	1,925.00	1,925.00	100.00%	0.00	1,925.00
	Totals	**86,983.00**	**86,983.00**			

Total Completed To Date:	86,983.00
Less Retainage	0.00
Less Previous Applications	0.00
Total Due This Invoice	86,983.00

CUSTOMER COPY

IP7015282

Cache Valley - Time and Material

		Hourly rate	Premium portion	week 2 hours
General Foreman	Straight time	$47.39		38
brook tangren	Time & a half	$65.65	$18.26	36
	Double time	$83.91	$36.52	5
				8
Foreman	Straight time	$44.35		0
dave dickerson	Time & a half	$61.09	$16.74	0
scott hansen	Double time	$77.83	$33.48	0
marty pavelka				0
				0
Journeyman Electrician	Straight time	$41.30		0
tim Mcguire	Time & a half	$56.52	$15.22	0
jeff dabb	Double time	$71.74	$30.44	0
danny oliver				7
				0
Apprentice Electrician	Straight time	$29.23		0
dave bonnell	Time & a half	$39.91	$10.68	40
jeff blake	Double time	$50.60	$21.37	40
cody clausen				week 2
derril barney				
mike maeko				
casey potter				

Mark-up (%)	Labor	14.60%
	Material	12.00%
	Subcontractor	10.00%
	Equipment	10.00%

Job # and phase codes

Job#	phase	
10283	10	total job bid
	9000	extra work added
	400	mobilize
	800	non-productive

2-13-05	
rate	wkly total
44.35	$ 1,685.30
47.39	$ 1,706.04
65.65	$ 328.25
83.91	$ 671.28
39.91	$ -
50.6	$ -
61.09	$ -
77.83	$ -
56.52	$ -
71.74	$ -
39.91	$ -
50.6	$ -
41.3	$ 289.10
56.52	$ -
71.74	$ -
29.23	$ 1,169.20
41.3	$ 1,652.00
2-13-05	$ 7,501.17

week 2-20-05		
hours	rate	wkly total
40	47.39	$ 1,895.60
20	29.23	$ 584.60
25	44.35	$ 1,108.75
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
week 2-13-05		$ 3,588.95

Job # and phase codes

Job#	phase	
10283	10	total job bid
	9000	extra work added
	400	mobilize
	800	non-productive

week 2-13-05		
hours	rate	wkly total
38	44.35	$ 1,685.30
36	47.39	$ 1,706.04
5	65.65	$ 328.25
8	83.91	$ 671.28
0	39.91	$ -
0	50.6	$ -
0	61.09	$ -
0	77.83	$ -
0	56.52	$ -
0	71.74	$ -
0	39.91	$ -
0	50.6	$ -
7	41.3	$ 289.10
0	56.52	$ -
0	71.74	$ -
40	29.23	$ 1,169.20
40	41.3	$ 1,652.00
week 2-13-05		$ 7,501.17

week 2-20-05		
hours	rate	wkly total
40	47.39	$ 1,895.60
20	29.23	$ 584.60
25	44.35	$ 1,108.75
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
week 2-13-05		$ 3,588.95

week 2-27-05		
hours	rate	wkly total
39	47.39	$ 1,848.21
1	65.65	$ 65.65
10	44.35	$ 443.50
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
week 3-06-05		$ 2,357.36

$ 7,501.17 $ 11,090.12 $ 13,447.48

week 3-06-05		
hours	rate	wkly total
37	47.39	$ 1,753.43
15	65.65	$ 984.75
13	83.91	$ 1,090.83
7	44.35	$ 310.45
13	61.09	$ 794.17
13	77.83	$ 1,011.79
13	61.09	$ 794.17
13	77.83	$ 1,011.79
13	39.91	$ 518.83
13	50.6	$ 657.80
156	56.52	$ 8,817.12
156	71.74	$ 11,191.44
8	41.3	$ 330.40
		$ -
		$ -
		$ -
		$ -
week 3-06-05		$ 29,266.97

week 3-13-05		
hours	rate	wkly total
33	47.39	$ 1,563.87
14	65.65	$ 919.10
40	29.23	$ 1,169.20
13	39.91	$ 518.83
24	29.23	$ 701.52
6	39.91	$ 239.46
48	41.3	$ 1,982.40
18	56.52	$ 1,017.36
149	41.3	$ 6,153.70
78	56.52	$ 4,408.56
58	44.35	$ 2,572.30
23	61.09	$ 1,405.07
		$ -
		$ -
		$ -
		$ -
		$ -
week 3-06-05		$ 22,651.37

week 3-20-05		
hours	rate	wkly total
40	47.39	$ 1,895.60
20	65.65	$ 1,313.00
5	41.3	$ 206.50
5	44.35	$ 221.75
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
week 3-06-05		$ 3,636.85

$ 42,714.45 $ 65,365.82 $ 69,002.67

week 3-27-05			
hours	rate	wkly total	
40	47.39	$	1,895.60
		$	-
		$	-
		$	-
		$	-
		$	-
		$	-
		$	-
		$	-
		$	-
		$	-
		$	-
		$	-
		$	-
		$	-
		$	-
		$	-
		$	-
week 3-06-05		$	1,895.60

grand total $ 70,898.27

9006

How much of this was charged extra?			
hours	rate	wkly total	
3	29.23	$	87.69
2	39.91	$	79.82
5	41.3	$	206.50
3	44.35	$	133.05
2	61.09	$	122.18
5	41.3	$	206.50
5	44.35	$	221.75
		$	-
		$	-
		$	-
		$	-
		$	-
		$	-
		$	-
		$	-
		$	-
total hours		$	-
25		$	-
week 3-06-05		$	1,057.49

week 2-13-05		
hours	rate	wkly total
38	44.35	$ 1,685.30
36	47.39	$ 1,706.04
5	65.65	$ 328.25
8	83.91	$ 671.28
0	39.91	$ -
0	50.6	$ -
0	61.09	$ -
0	77.83	$ -
0	56.52	$ -
0	71.74	$ -
0	39.91	$ -
0	50.6	$ -
7	41.3	$ 289.10
0	56.52	$ -
0	71.74	$ -
40	29.23	$ 1,169.20
40	41.3	$ 1,652.00
week 2-13-05		$ 7,501.17

week 2-20-05		
hours	rate	wkly total
40	47.39	$ 1,895.60
20	29.23	$ 584.60
25	44.35	$ 1,108.75
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
week 2-13-05		$ 3,588.95

week 2-27-05		
hours	rate	wkly total
39	47.39	$ 1,848.21
1	65.65	$ 65.65
10	44.35	$ 443.50
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
week 3-06-05		$ 2,357.36

week 3-06-05		
hours	rate	wkly total
37	47.39	$ 1,753.43
15	65.65	$ 984.75
13	83.91	$ 1,090.83
7	44.35	$ 310.45
13	61.09	$ 794.17
13	77.83	$ 1,011.79
13	61.09	$ 794.17
13	77.83	$ 1,011.79
13	39.91	$ 518.83
13	50.6	$ 657.80
156	56.52	$ 8,817.12
156	71.74	$ 11,191.44
8	41.3	$ 330.40
		$ -
		$ -
		$ -
		$ -
week 3-06-05		$ 29,266.97

week 3-13-05		
hours	rate	wkly total
33	47.39	$ 1,563.87
14	65.65	$ 919.10
40	29.23	$ 1,169.20
13	39.91	$ 518.83
24	29.23	$ 701.52
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78	56.52	$ 4,408.56
58	44.35	$ 2,572.30
23	61.09	$ 1,405.07
		$ -
		$ -
		$ -
		$ -
		$ -
week 3-06-05		$ 22,651.37

week 3-20-05		
hours	rate	wkly total
40	47.39	$ 1,895.60
20	65.65	$ 1,313.00
5	41.3	$ 206.50
5	44.35	$ 221.75
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
week 3-06-05		$ 3,636.85

week 3-27-05		
hours	rate	wkly total
40	47.39	$ 1,895.60
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
		$ -
week 3-06-05		$ 1,895.60

total added up for the hourly wages
$ 70,898.27

Cache Valley - Time and Material

		Hourly rate	Premium portion
General For	Straight time	$47.39	
brook tangre	Time & a half	$65.65	$18.26
	Double time	$83.91	$36.52
Foreman	Straight time	$44.35	
dave dickers	Time & a half	$61.09	$16.74
scott hansen	Double time	$77.83	$33.48
marty pavelka			
brian pershon			
bruce bradshaw			
jeff dabb			
Journeymai	Straight time	$41.30	
danny oliver	Time & a half	$56.52	$15.22
eric ward	Double time	$71.74	$30.44
jerry bowman			
jerry tangren			
joe riley			
martin lindgren			
matt mchugh			
mike heaps			
mike nielsen			
patrick howard			
randy charlton			
robert hawkins			
robert plett			
tim Mcguire			
Apprentice	Straight time	$29.23	
dave bonnell	Time & a half	$39.91	$10.68
jeff blake	Double time	$50.60	$21.37
cody clausen			
derril barney			
mike maeko			
casey potter			
mike schille			
chris Zdunich			

Mark-up (%	Labor	14.60%
	Material	12.00%
	Subcontractor	10.00%
	Equipment	10.00%

From: "Craig Mullen" <cmullen@gslelectric.com>
To: <jon-c@ipsc.com>
Date: 1/22/2004 3:48:01 PM
Subject: ID Fan VFD

Jon:

In accordance with your request, we submit the following pricing and scope of work for your review.

1. De-terminate and mark all wiring associated with this move and drop cable into the tray below.
2. Disconnect ventilation system duct work and cap with a piece of 14 gage sheetmetal.
3. Continue circulating water mechanical piping to VFD unit.
4. Remove existing VFD and place in Owner provided storage.
5. Re-install new VFD unit and anchor into place (Owner to provide anchors and anchoring details).
6. Re-terminate existing wiring and jumpers as per the drawings that you provided for us. Labeling of all wiring per plant specification.
7. This work will be done between 7:00 am on February 28, 2004 and complete on or before March 9, 2004.
8. We will provide our General Foreman, Terry Grady to assist you in the start-up on March 10th.
9. Originally this work was scheduled during your Unit #2 power outage but now you have given us the time frame as mentioned in note 7. This work will require overtime at the start to see that we complete this project in the time frame allowed.
10. We have utilized the same pricing structure that we have in place with our T&M rates.

TOTAL PRICE: $32,605.00

Thank You,

Craig Mullen

CC: "Mike Nuttall" <mike-n@ipsc.com>

From: "Craig Mullen" <cmullen@gslelectric.com>
To: <jon-c@ipsc.com>
Date: 1/22/2004 3:48:01 PM
Subject: ID Fan VFD

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10. We have utilized the same pricing structure that we have in place with our T&M rates.

TOTAL PRICE: $32,605.00

Thank You,

Craig Mullen

CC: "Mike Nuttall" <mike-n@ipsc.com>

Planning for Preventative Maintenance for New Alstom ID fan drives
Meeting Conf. Rm. 1
8-24-05 10:00 AM

"All I ask is the chance to prove that money cannot make me happy." Anonymous

1. Options on how to handle DI tank recharging and replacement.

    a. Once a tank is replaced immediately refill the tank with dry resin.

    b. Have a weekly WO to ensure each unit has a dry tank ready to go.
        - This way all the person who replaces the tank will have to flush 12 gallons of DI water in the dry resin tank.

2. Time synchronization schedule/ Networking of HMI output.

3. Electro Industies meters.

    a. meters that match already installed are $1916.00 with 3 week delay (4-20mA output).
    b. upgraded version option are $868.00 with 1 week delay (RS 485 Mod Bus serial comm. Protocol).

4. Buying a couple of handheld conductivity probes.

    a. the EP model is suggested

5. John and Kevin questions.

Commissioning Schedule for IPSC Dual Channel ID Fans (Unit 2 1A, 1B & 1C)

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
MARCH 26, 2006	**MARCH 27, 2006**	**MARCH 28, 2006** - -	**MARCH 29, 2006** - Stage testing equipment for commissioning. - Phones, tables, power boards for multi-plugs, chairs, garbage pails etc.	**MARCH 30, 2006** - (CVE) stages drives. - (CVE) making sure labels on cables are taped down so not to loose them.	**MARCH 31, 2006** - (CVE) staging equipment necessary to begin extraction. - (CVE) making sure labels on cables are taped down so not to loose them.	**APRIL 01, 2006** - 6:00 am Request full clearance to be hung. - 8:00 am Sign on clearance. Request grounds to be hung. - 9:00 am Sign on gnds. - (CVE) begins.
APRIL 02, 2006 - 2nd day for CVE. (CVE) New drives in place and re-wiring begun. - (IPSC/ I&C) wire all remote I/O cabinets	**APRIL 03, 2006** - 3rd day for CVE. (CVE) Continue to re-wire new drives. - (CVE) Begin to verify wiring of drives. - (CVE) Verify all HV connections are same as before. - (CVE) start switchgear wiring.	**APRIL 04, 2006** - (CVE) done with drive cubicles. - (Alstom/IPSC) inspects installation. - (Alstom/IPSC) begin to re-connect shipping splits. - 10:00 am Alter clearance to give 480V and 120V for cabinet lights, rcptcl. pump and cntrl power. - (IPSC) electricians fill cooling systems with DI water and purge all air.	**APRIL 05, 2006** - (Alstom/IPSC) Complete shipping split re-connection. - (Alstom/IPSC)Continue verification of all internal wiring of drives. - (CVE) HV cable support – Link reactor and xfmr work complete. - (CVE) Switchgear cubicles done. - (IPSC) electricians done filling cooling systems and purging of all air.	**APRIL 06, 2006** - (Nate)Verify all wiring in switchgear cubicles. - (IPSC) Verify all HV connections are supported etc. - (IPSC) Verify all xfmr and link reactor work is done. - End of day Request clearance pulled off of all the ID fans and caution tags put in place (except for slide link tags)	**APRIL 07, 2006** - Morning Sign on caution tag clearance. - (IPSC/Alstom) Begin low voltage power-up checks. - (IPSC/Alstom) Begin I/O checks on all ID fan drives. - (Nate) Verify all wiring in Remote I/O cabinets.	**APRIL 08, 2006** - (IPSC/Alstom) Continue I/O checks. - (Relay Techs) Test switchgear tripping mechanism.
APRIL 09, 2006 - (IPSC/Alstom) Continue all I/O checks.	**APRIL 10, 2006** -(IPSC/Alstom) Continue all I/O checks. - (Alstom /Relay Techs) Start HV trip testing (A, B and C drives). - (IPSC/Alstom) Continue HV testing Phasing, DC OC test, OL SC test, CL SC test, E-stop checks etc.	**APRIL 11, 2006** - (IPSC/Alstom) Continue HV testing Phasing, DC OC test, OL SC test, CL SC test, E-stop checks etc.- (IPSC/Alstom) Thorough pulse tests on all drives.	**APRIL 12, 2006** - (IPSC/Alstom) Field Exciter testing.asd - (IPSC/Alstom) Continue pulse testing. - (IPSC/Alstom) Continue HV testing Phasing, DC OC test, OL SC test, CL SC test, E-stop checks etc.	**APRIL 13, 2006** - (Alstom/IPSC) Motor disconnect switch testing. - (IPSC/Alstom) Continue HV testing Phasing, DC OC test, OL SC test, CL SC test, E-stop checks etc. - (IPSC/Alstom) complete pulse testing.	**APRIL 14, 2006** - (Alstom/IPSC) Motor disconnect switch test - (IPSC/Alstom) Continue HV testing Phasing, DC OC test, OL SC test, CL SC test, E-stop checks etc. - (IPSC/Alstom) complete pulse testing.	**APRIL 15, 2006** - (IPSC/Alstom) Complete HV testing for all drives. -(IPSC) Jumper ID fan dampers in preparation for bottled up rotational tests. - (IPSC/Alstom) motor rotational checks/Encoder sequence testing.
APRIL 16, 2006 - Request OK TO HOT from operations to move leads for voltage dividers. - (IPSC/Alstom) Check A, B and C drives for preliminary rotation tests. -(IPSC/Alstom) set up voltage dividers on A. - (IPSC/Alstom) Begin rotation tests on A. **Requires mid-speed**	**APRIL 17, 2006** - (IPSC/Alstom) Continue to test A for proper encoder configuration tests. No load testing. Proper phase rotation on stator. **Requires mid-speed**	**APRIL 18, 2006** - (IPSC/Alstom) Continue with B ID fan encoder configuration tests. No load testing. Proper phase rotation on stator. **Requires mid-speed**	**APRIL 19, 2006** - (IPSC/Alstom) Finish B ID fan encoder configuration. No load testing. Proper phase rotation on stator. Start C **Requires mid-speed**	**APRIL 20, 2006** - (IPSC/Alstom) Finish C ID fan encoder configuration. No load testing. Proper phase rotation on stator. **Requires mid-speed**	**APRIL 21, 2006** Single Channel No load testing. Speed Regulator Control Speed Regulator control checks v/f control checks start/stop checks Operational and stability checks. Master/Slave chop overs **Requires mid-speed**	**APRIL 22, 2006** Single Channel No load testing. Speed Regulator Control Speed Regulator control checks v/f control checks start/stop checks Operational and stability checks. Master/Slave chop overs **Requires mid-speed**

IP7015293

Commissioning Schedule for IPSC Dual Channel ID Fans (Unit 2 1A, 1B & 1C)

APRIL 23, 2006	APRIL 24, 2006	APRIL 25, 2006	APRIL 26, 2006	APRIL 27, 2006	APRIL 28, 2006	APRIL 29, 2006
APRIL 30, 2006	MAY 01, 2006	MAY 02, 2006	MAY 03, 2006	MAY 04, 2006	MAY 05, 2006	MAY 06, 2006

Commissioning Schedule for IPSC Dual Channel ID Fans (Unit 2 1A, 1B & 1C)

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
MARCH 26, 2006	**MARCH 27, 2006**	**MARCH 28, 2006** - -	**MARCH 29, 2006** - Stage testing equipment for commissioning. - Phones, tables, power boards for multi-plugs, chairs, garbage pails etc.	**MARCH 30, 2006** - (CVE) stages drives. - (CVE) making sure labels on cables are taped down so not to loose them.	**MARCH 31, 2006** - (CVE) staging equipment necessary to begin extraction. - (CVE) making sure labels on cables are taped down so not to loose them.	**APRIL 01, 2006** - 6:00 am Request full clearance to be hung. - 8:00 am Sign on clearance. Request grounds to be hung. - 9:00 am Sign on gnds. - (CVE) begins.
APRIL 02, 2006 - 2nd day for CVE. (CVE) New drives in place and re-wiring begun. - (IPSC/ I&C) wire all remote I/O cabinets	**APRIL 03, 2006** - 3rd day for CVE. (CVE) Continue to re-wire new drives. - (CVE) Begin to verify wiring of drives. - (CVE) Verify all HV connections are same as before. - (CVE) start switchgear wiring.	**APRIL 04, 2006** - (CVE) done with drive cubicles. - (Alstom/IPSC) inspects installation. - (Alstom/IPSC) begin to re-connect shipping splits. - 10:00 am Alter clearance to give 480V and 120V for cabinet lights, rcptcl. pump and cntrl power. - (IPSC) electricians fill cooling systems with DI water and purge all air.	**APRIL 05, 2006** - (Alstom/IPSC) Complete shipping split re-connection. - (Alstom/IPSC)Continue verification of all internal wiring of drives. - (CVE) HV cable support – Link reactor and xfmr work complete. - (CVE) Switchgear cubicles done. - (IPSC) electricians done filling cooling systems and purging of all air.	**APRIL 06, 2006** - (Nate)Verify all wiring in switchgear cubicles. - (IPSC) Verify all HV connections are supported etc. - (IPSC) Verify all xfmr and link reactor work is done. - End of day Request clearance pulled off of all the ID fans and caution tags put in place (except for slide link tags)	**APRIL 07, 2006** - Morning Sign on caution tag clearance. - (IPSC/Alstom) Begin low voltage power-up checks. - (IPSC/Alstom) Begin I/O checks on all ID fan drives. - (Nate) Verify all wiring in Remote I/O cabinets.	**APRIL 08, 2006** - (IPSC/Alstom) Continue I/O checks. - (Relay Techs) Test switchgear tripping mechanism.
APRIL 09, 2006 - (IPSC/Alstom) Continue all I/O checks.	**APRIL 10, 2006** -(IPSC/Alstom) Continue all I/O checks. - (Alstom /Relay Techs) Start HV trip testing (A, B and C drives). - (IPSC/Alstom) Continue HV testing Phasing, DC OC test, OL SC test, CL SC test, E-stop checks etc.	**APRIL 11, 2006** - (IPSC/Alstom) Continue HV testing Phasing, DC OC test, OL SC test, CL SC test, E-stop checks etc.-(IPSC/Alstom) Thorough pulse tests on all drives.	**APRIL 12, 2006** - (IPSC/Alstom) Field Exciter testing.asd - (IPSC/Alstom) Continue pulse testing. - (IPSC/Alstom) Continue HV testing Phasing, DC OC test, OL SC test, CL SC test, E-stop checks etc.	**APRIL 13, 2006** - (Alstom/IPSC) Motor disconnect switch testing. - (IPSC/Alstom) Continue HV testing Phasing, DC OC test, OL SC test, CL SC test, E-stop checks etc. - (IPSC/Alstom) complete pulse testing.	**APRIL 14, 2006** - (Alstom/IPSC) Motor disconnect switch test - (IPSC/Alstom) Continue HV testing Phasing, DC OC test, OL SC test, CL SC test, E-stop checks etc. - (IPSC/Alstom) complete pulse testing.	**APRIL 15, 2006** - (IPSC/Alstom) Complete HV testing for all drives. -(IPSC) Jumper ID fan dampers in preparation for bottled up rotational tests. - (IPSC/Alstom) motor rotational checks/Encoder sequence testing.
APRIL 16, 2006 - Request OK TO HOT from operations to move leads for voltage dividers. - (IPSC/Alstom) Check A, B and C drives for preliminary rotation tests. -(IPSC/Alstom) set up voltage dividers on A. - (IPSC/Alstom) Begin rotation tests on A. **Requires mid-speed**	**APRIL 17, 2006** - (IPSC/Alstom) Continue to test A for proper encoder configuration tests. No load testing. Proper phase rotation on stator. **Requires mid-speed**	**APRIL 18, 2006** - (IPSC/Alstom) Continue with B ID fan encoder configuration tests. No load testing. Proper phase rotation on stator. **Requires mid-speed**	**APRIL 19, 2006** - (IPSC/Alstom) Finish B ID fan encoder configuration. No load testing. Proper phase rotation on stator. Start C **Requires mid-speed**	**APRIL 20, 2006** - (IPSC/Alstom) Finish C ID fan encoder configuration. No load testing. Proper phase rotation on stator. **Requires mid-speed**	**APRIL 21, 2006** Single Channel No load testing. Speed Regulator Control Speed Regulator control checks v/f control checks start/stop checks Operational and stability checks. Master/Slave chop overs **Requires mid-speed**	**APRIL 22, 2006** Single Channel No load testing. Speed Regulator Control Speed Regulator control checks v/f control checks start/stop checks Operational and stability checks. Master/Slave chop overs **Requires mid-speed**

IP7015295

Commissioning Schedule for IPSC Dual Channel ID Fans (Unit 2 1A, 1B & 1C)

APRIL 23, 2006	APRIL 24, 2006	APRIL 25, 2006	APRIL 26, 2006	APRIL 27, 2006	APRIL 28, 2006	APRIL 29, 2006
APRIL 30, 2006	MAY 01, 2006	MAY 02, 2006	MAY 03, 2006	MAY 04, 2006	MAY 05, 2006	MAY 06, 2006

Commissioning Schedule for IPSC Dual Channel ID Fans (Unit 2 1A, 1B & 1C)

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
APRIL 09, 2006 - (Relay Techs) Test switchgear tripping mechanism. - (Alstom/IPSC) E-Stop test to verify HV bkr trips - (Alstom/IPSC) Phasing checks. - (Alstom/IPSC) DC link open circuit test. - ACCB fast phase back timing check.	**APRIL 10, 2006** - Open loop short circuit tests. - Closed loop short circuit tests. - remove O/P disconnect DNO tags one at a time as needed.	**APRIL 11, 2006** - Mode 1 checks - Stator volts feedback phasing and encoder alignment checks. - Speed regulator control checks. - Single channel load test-preliminary tests. - V/f checks. **- ready for full load testing on weekend!!**	**APRIL 12, 2006**	**APRIL 13, 2006**	**APRIL 14, 2006**	**APRIL 15, 2006** **Full load testing Requires Full draft** Dual Channel Full Load Tests. Beta and recovery time checks. E-Stop, master/slave chop over… Perform on all three (3) fans. Beta and recovery time checks. E-Stop,
APRIL 16, 2006 **Full load testing Requires** Dual Channel Full Load Tests. Beta and recovery time checks. E-Stop, master/slave chop over… Perform on all three (3) fans. Beta and recovery time checks. E-Stop,	**APRIL 17, 2006** Hand over drives to operations??? Or Training on the drives 2APC-MCC-2B03 Start full test on all loads off 2APC-MCC-2B03 and swapping of the one bucket with spare.	**APRIL 18, 2006** Hand over drives to operations??? Or Training on the drives 2APC-MCC-2B03 full test on all loads off 2APC-MCC-2B03 and swapping of the one bucket with spare.	**APRIL 19, 2006** Hand over drives to operations??? Or Training on the drives Inspect unit 2 generator shaft grounding resistor and monitor.	**APRIL 20, 2006** Hand over drives to operations??? Or Training on the drives	**APRIL 21, 2006** Hand over drives to operations??? Or Training on the drives	**APRIL 22, 2006** **- Full load testing Requires Full draft** Dual Channel Full Load Tests. Beta and recovery time checks. E-Stop, master/slave chop over… Perform on all three (3) fans. Beta and recovery time checks. E-Stop,
Sunday	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**
APRIL 23, 2006 **- Full load testing Requires Full draft** Dual Channel Full Load Tests. Beta and recovery time checks. E-Stop, master/slave chop over… Perform on all three (3) fans. Beta and recovery time checks. E-Stop,	**APRIL 24, 2006** Clearance 'D' drive for PM's and put fire mastic insulation on delta drive as well	**APRIL 25, 2006**	**APRIL 26, 2006**	**APRIL 27, 2006** Monitor performance of drives.	**APRIL 28, 2006** Monitor performance of drives.	**APRIL 29, 2006**
APRIL 30, 2006	**MAY 01, 2006** .	**MAY 02, 2006**	**MAY 03, 2006**	**MAY 04, 2006**	**MAY 05, 2006**	**MAY 06, 2006** Monitor performance of drives.

IP7015297

Anticipatory Punch-list on ID fan drive installation

ID Fan Punch List
Outage 2007

Extra items that must be completed before end of outage.

1. Internal wiring change for the output key disconnect alarm.
2. Internal wiring modification for the separate power supply alarms.
3. Tune the Reactor fan venturi switches to minimize nuisance alarms.
4. Re-torque all regulator cabinet wiring and 480 V and shipping split wiring connections.
5. Put fresh DI resin beads in all eight DI tanks in drive 1A1, 1A2, 1B1, 1B2, 1C1, 1C2, 1D1 & 1D2.
6. Paint keys and inscribe on them the drive name that they pertain to (ie. U1 1A1). Give extra keys (painted and inscribed) to Jon Christensen.
7. Essential services feed to ID fan drives 1C1, 1C2, 1D1 and 1D2 ID fan drives need terminating. We are replacing the #12 run that was done in the 1980's with number 8 AWG. The cables are already pulled but just need to be terminated.
8. Ensure that IPSC laptops have most recent version of code for the SPANG, SIGMA and HMI controllers.

General tasks

1. Laminate updated prints in the regulator cabinet and the O/P disconnect cab and the pump cabinet.
2. Set up the work area with at least three 50 foot extension cords, 2 tables, 4 chairs and two power strips.
2. Get all voltage dividers and their corresponding carts over to unit one ID fan room.
3. General clean up of area and return all tools.
4. Fuses- replace missing.
5. (Nathan) update and close-out all prints.

Note: Any other regular PM jobs performed should **not** be charged to the 02-53663 work order.

Agenda
ID Fan Schedule
April Outage 2006

I. ID Fan Replacement this years outage.

In April we plan to fully replace ID fan drives 1A1, 1A2, 1B1, 1B2, 1C1 and 1C2. Considering other work being done our control system, Generator excitation and Generator step up transformer it will be extra important to have a well defined schedule for all to see.

II. Going over schedule

II. Testing

Necessary notes taken:

ID Fan Punch List
Outage 2006

A fan prioritized list

1. Reactor fan in 1A1 drive is noisy.
2. Re-tap both 1A1 and 1A2 xfmrs to the 4-5 tap (No more than 15 foot-lbs of torque).
3. Pulse test for the newly replaced thyristor module.
4. Re-torque all control and 480 V and control wiring connections.
6. Fire Mastic installation (To be done on Thursday).
7. Put fresh DI resin beads in DI tank.
8. Paint keys and inscribe on them the drive they pertain to.
9. Redo 1A1 pecker-head terminations (Not necessary)

B fan prioritized list

1. Re-tap both 1B1 and 1B2 xfmrs to the 4-5 tap (No more than 15 foot-lbs of torque).
2. Re-torque all control and 480 V connections and control wiring connections.
3. Fire Mastic installation (To be done on Thursday).
4. Put fresh DI resin beads in DI tank.
5. Paint keys and inscribe on them the drive they pertain to.

C fan prioritized list

1. Re-tap both 1C1 and 1C2 xfmrs to the 4-5 tap (No more than 15 foot-lbs of torque).
2. Re-torque all control and 480 V connections and control wiring connections.
3. Fire Mastic installation (To be done on Thursday).
4. Put fresh DI resin beads in DI tank.
5. John Fritches needs to calibrate the xfmr thermocouple elements.
6. Paint keys and inscribe on them the drive they pertain to.

D fan list

1. Essential services feed to Delta ID fan drives need terminating.

General tasks

1. Laminate updated prints in the regulator cabinet and the O/P disconnect cab and the pump cabinet.
2. Get all voltage divider over to unit one ID fan room for the next outage.

3. General clean up of area and return all tools.
4. Fuses- replace missing.
5. (Nathan) update and close-out all prints.

Note: Any other regular PM jobs performed should **not** be charged to the 02-53663 work order.

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Dual Channel Synchdrive Commissioning Schedule

	REF	TEST	PRE-CONDITIONS	Hrs
LV CHECKS 120V/480V Supplies on 1 man/channel	1.	**Preparation**	All test equipment on site	8
	2.	General equipment check	All Drives/auxiliaries on site & erected	4
	3.	Interconnections		4
	4.	Preliminary check with power off	All cabling complete & contractors off drive	4
	5.	Low voltage supply check	All auxiliary supplies available i.e. 480V, 120V phase reference	4
	6.	Cooling system fill & check	Customer provided de-ionised water on site and available	8
	7.	Power up regulator / gating power supply		2
	8.	Download software	Program complete and tested in factory	1
	9.	Digital I/O relay logic check		16
	10.	Analog I/O check		8
	11.	Exciter Reference Checks		6
	12.	Diagnostic serial link check		1
	13.	Hardware over current check		2
	14.	Supply breaker interlocks		2
	15.	Firing pulse check		8
	16.	Encoder Switching sequence Tests	Manual rotation of motor available. This may include all motor bearing lubrication to be commissioned. If encoder setup is completed prior to this then not necessary.	8
HV Checks Main Power on 1 man/channel	17.	Emergency Stop Tests to verify HV breaker will trip for E-Stop		2
	18.	Phasing checks	Main HV power available	4
	19.	DC link open circuit tests		4
	20.	Open Loop Short Circuit Tests	Shorting link to be fitted	4
	21.	Closed Loop Short Circuit Tests		2
	22.	Single channel uncoupled safety inspection		4
	23.	Main ACCB fast phase back timing check	Customer responsibility to be verified by Alstom	2
	24.	Emergency Stop Tests to verify HV breaker will trip for E-Stop		2
Motor rotational checks All power supplies on Freedom to run motor as needed	25.	Mode 1 checks	Motor made safe & ready to run	4
	26.	Stator volts feedback phasing and encoder alignment check		4
	27.	Speed regulator control check		4
	28.	Single channel load test-preliminary checks	Motor must be coupled. This may introduce a few hours time delay.	4
	29.	V/f control checks		4
	30.	Single channel load tests Remote mode		4
	31.	Dual channel no load operational & stability checks		4
	32.	Stop/Start Tests		2
	33.	Dual channel Full Load Current Checks	Entire Boiler available including all auxilliaries needed to draw 100% speed & load.	8
	34.	Chop over Checks		8
	35.	Final Procedures & wrap-up		8
	36.	Complete harmonic measurements		8
	37.	Hose re-torque		4
			TOTAL HOURS	176

IP7015301

AQCS Chilled Water System Modification Schedule

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
MARCH 26, 2006	**MARCH 27, 2006**	**MARCH 28, 2006** - install new control panel for ch wtr pmps - terminate all circuits going into new cntrl pnl. -	**MARCH 29, 2006** - install new control panel for ch wtr pmps - terminate all circuits going into new cntrl pnl. -	**MARCH 30, 2006** - install new control panel for ch wtr pmps - terminate all circuits going into new cntrl pnl. -	**MARCH 31, 2006** Day off	**APRIL 01, 2006** - jumper the MCC buckets for Baker and Delta pumps. - terminate cntrl wiring to Alpha and Charlie MCC buckets. - Make sure led lights function properly. - get I&C to add the three rungs in the ladder logic.
APRIL 02, 2006 Stay home and rest.	**APRIL 03, 2006** - jumper the MCC buckets for Alpha and Charlie to stay on. - terminate cntrl wrg for Baker and Delta pumps. - Make sure led lights function properly. - terminate the alarms to the scrubber common modicon.	**APRIL 04, 2006** - demolition and re-wire of 2SCB-LTCP-1 (Old LTCP) .	**APRIL 05, 2006** - Begin testing with all four pumps. - Standby pump start verification - Hand Switch (HS) position alarm. - both pumps off alarm testing. - power supply off alarm test.	**APRIL 06, 2006** - standby start of air handling unit test. - as weather and heat loading of cooling system permits continue with the following tests. 1. low ambient free cooling (cold and warm) 2. Ambient temp. near 45 deg F (40 – 50 deg F).	**APRIL 07, 2006** - Balance water flow through all ID fan drives.	**APRIL 08, 2006** NOTE: (IPSC/Alstom) Start high current heat testing on ID fan drives.
APRIL 09, 2006	**APRIL 10, 2006**	**APRIL 11, 2006**	**APRIL 12, 2006**	**APRIL 13, 2006** - differential pressure switches arrive. - Install the switches and test them (Warning ID fan people when it will be tested) NOTE: (IPSC/Alstom) High current heat testing on ID fan drives.	**APRIL 14, 2006** - differential pressure switches arrive. - Install the switches and test them them (Warning ID fan people when it will be tested) NOTE: (IPSC/Alstom) High current heat testing on ID fan drives.	**APRIL 15, 2006**

OK-TO HOT FOR UNIT ONE ID FANS 1A & 1B REPLACEMENT (APRIL 09, 2007)

	SOURCE 1A1		LABEL
	Trip & Close power	1APE-SWG-1A2 CUB 2	AX and AY for bkr close and bkr trip
Last major Alteration of major ID fan clearance. Change all 6.9 KV bkrs to caution in "OFF" position and remove DNO tag from all O/P disconnects.	1APE-SWG-1A2 Change to Caution	CUB 2	1CCE-XF-1A1 ID FAN XFMR 1A1
	Output disconnect switch 1A1 NO TAG	ID fan drive 1A1	ID fan drive 1A1
	1APC-1MCC 1A12	10-A	1CCE-EXX-1A1-B ID FAN VAR SP DRV 1A1 (EXCITER)
	1APA-PPL-108	BKR 7	1CCE-XF-1A1 (1CCEK260203)
Nathan wants to follow operator and watch the caution tags being hung in the "OFF" position so he will not need to walk it down later.	1APA-PPL-108	BKR 31:33:35	1CCE-29-1A1 (1CCEK213107)
	1APA-PPL-109	BKR 8	1CCE-EXX-1A1 (1CCEK2122B18)
	1API-PPL-1	BKR 2	1CCE-EXX-1A1 ID FAN VARIABLE SPEED DRIVE 1A1 (1CCEK2121B13)

	SOURCE 1B1		LABEL
	Trip & Close power	1APE-SWG-1A2 CUB 4	AX and AY for bkr close and bkr trip
	1APE-SWG-1A2 Change to Caution	CUB 4	1CCE-XF-1B1 ID FAN XFMR 1B1
	Output disconnect switch 1B1 NO TAG	ID fan drive 1B1	ID fan drive 1B1
	1APC-1MCC 1A12	11-A	1CCE-EXX-1B1-B ID FAN VAR SP DRV 1B1 (EXCITER)
	1APA-PPL-108	BKR 8	1CCE-29-1B1 (1CCEK260303)
	1APA-PPL-108	BKRS 32:34:36	1CCE-29-1B1 (1CCEK213207)
	1APA-PPL-109	BKR 12	1CCE-EXX-1B1 (1CCEK2123B18)
	1API-PPL-1	BKR 4	1CCE-EXX-1B1 ID FAN VARIABLE SPEED DRIVE 1B1

Note for Nathan:

	SOURCE 1A2		LABEL
	Trip & Close power	1APE-SWG-1A2 CUB 3	AX and AY for bkr close and bkr trip
	1APE-SWG-1A2 Change to Caution	CUB 3	1CCE-XF-1A2 ID FAN XFMR 1A2
	Output disconnect switch 1A2 NO TAG	ID fan drive 1A2	ID fan drive 1A2
At this point nathan wants perrmission from operations to move leads on voltage dividers	1APC-1MCC 1A32	1-D	1CCE-EXX-1A2-B ID FAN VAR SP DRV 1A2 (EXCITER)
	1APA-PPL-108	BKR 9	1CCE-XF-1A2 (1CCEK260206)
	1APA-PPL-109	BKR 10	1CCE-EXX-1A2 (1CCEK2122B29)
	1API-PPL-3	BKR 2	1CCE-EXX-1A2 ID FAN VARIABLE SPEED DRIVE 1A2

	SOURCE 1B2		LABEL
	Trip & Close power	1APE-SWG-1A2 CUB 5	AX and AY for bkr close and bkr trip
	1APE-SWG-1A2 Change to Caution	CUB 5	1CCE-XF-1B2 ID FAN XFMR 1B2
	Output disconnect switch 1B2 NO TAG	ID fan drive 1B2	ID fan drive 1B2
	1APC-1MCC 1A32	9-A	1CCE-EXX-1B2-B ID FAN VAR SP DRV 1B2 (EXCITER)
	1APA-PPL-108	BKR 10	1CCE-XF-1B2 (1CCEK260306)
	1APA-PPL-109	BKR 14	1CCE-EXX-1B2 (1CCEK2124B29)
	1API-PPL-3	BKR 4	1CCE-EXX-1B2 ID FAN VARIABLE SPEED DRIVE 1B2

REMOTE I/O	5 LINKS TOTAL	LABEL
	TB7-258,261	
	TB7-286,289	1COF-CAB-31 WIRING
	TB8-313	

Nathan Crop
1/27/2006

REMOTE I/O	5 LINKS TOTAL	LABEL
	TB7-258,261	
	TB7-286,289	1COF-CAB-32 WIRING
	TB8-313	

THE 1APH-PPL-3A IS IN PARALLEL WITH FAB FILTER 1A CNTL PNL. Must have a technician detach the ID fan wire then sign off on this tag so the fab filter works. See 1APH-E1700. Also the pp 109 ckt can stay off permanently.	SOURCES in Annunciator panel	LABEL	BKR	CKT
	125 VDC DC PP 3A 1APH-PPL-3A	ID FAN VAR SP DRV ANN CAB 1	1	(1CCEK2606C05)
	120 V AC PP 109 1APA-PPL-109	ID FAN VAR SP DRV ANN CAB 1	2	(1CCEK2606C06)

Nathan Crop

1/7/2007

IP7015303

Commissioning Schedule for IPSC Dual Channel ID Fans (Unit 1 1A & 1B)

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
MARCH 26, 2007	**MARCH 27, 2007**	**MARCH 28, 2007** - -	**MARCH 29, 2007** - Stage testing equipment for commissioning. - Phones, tables, power boards for multi-plugs, chairs, garbage pails etc.	**MARCH 30, 2007** - (CVE) stages drives. - (CVE) staging equipment necessary - (CVE) making sure labels on cables are taped - (IPSC) stage desks, phone, 3-50' ext. cords, power strips, computer, voltage dividers.	**MARCH 31, 2007** - 6:00 am Request full clearance to be hung. - 8:00 am Sign on clearance. Request grounds to be hung. 4 elec to walk down - 9:00 am Sign on gnds. - (CVE) begins. **(ipsc to megger mtrs & encoder rings)**	**APRIL 01, 2007** - 1st day for CVE. (CVE) New drives in place and re-wiring begun. 2 elec support
APRIL 02, 2007 - 2nd day for CVE. (CVE) New drives in place and re-wiring begun. 2 elec support - (IPSC/ I&C) remote I/O - (CVE) Switchgear cubicles (Nathan). - (CVE) HV cable support – Link reactor and xfmr work complete. - (IPSC) Nate Verify all xfmr and link reactor work is done-HV support	**APRIL 03, 2007** - 3rd day for CVE. (CVE) Continue to re-wire new drives. - (CVE) Begin to verify wiring of drives. 2 elec - (CVE) Verify all HV connections are same as before. 2 elect - (CVE) finish switchgear wiring. - (Nate)Verify. -(CVE) finishes work at midnight. (Three-24 hour periods given to CVE).	**APRIL 04, 2007** - 8:00 am Alter clearance to give 480V and 120V for cabinet lights, rcptcl. pump and cntrl power. - (Alstom/IPSC) inspects installation. Wiring checks 4 elec - (Alstom/IPSC) begin to re-connect shipping splits. *Tight connections* - (IPSC) 2 elec start on one drive fill cooling systems with DI. Check for freeze damage in tank	**APRIL 05, 2007** - (Alstom/IPSC) Complete shipping split re-connection 1-elect. - (Alstom/IPSC) All electrical connections are to be tightened 1 elec. - (IPSC) electricians fill cooling systems on all drives complete 2 elec. - (IPSC) check for (leaks). -fix leaks and re-fill 2 elec.	**APRIL 06, 2007** - (IPSC/Alstom) 2 elec - Low voltage power-up checks. - (IPSC/Alstom) 2 elec all day encoder wrg open exciter housing and verify all parts are tight. - (Nate) Verify all wiring in Remote I/O cabinets. - (IPSC/Alstom) 2 elec – If complete with low voltage power-up checks. Start with I/O verification.	**APRIL 07, 2007** - (IPSC/Alstom) Low voltage power up checks. - (IPSC/Alstom) I/O checks on all ID fan drives. - (IPSC/Alstom) complete encoder wrg. Close down the exc housing. Evening-ask for HV caution tags on 6.9kv O/P still DNO'ed. sign off if we can to have clearance ready for Monday morn.	**APRIL 08, 2007** Easter
APRIL 09, 2007 - Morning Sign on clearance cautions on 6.9kv. OK TO HOT ALERT 6.9KV - (IPSC/Alstom)2 elec finish I/O checks on A drives. - (IPSC/Alstom) 2 elec finish encoder wiring and close all exciter housing.	**APRIL 10, 2007** -(IPSC/Alstom) finish all I/O checks on B drives. - (Alstom /Relay Techs) Start HV trip testing (A & B drives). (Need relay techs) ALERT 6.9KV - (IPSC/Alstom) HV (IPSC/Alstom) 2 elect Thorough pulse tests on all drives.	**APRIL 11, 2007** (IPSC/Alstom) 2 elec pulse tests on all drives. (IPSC/Alstom) 2 elect modifies back panel doors (top bolt). - (IPSC/Alstom) 2 elec Begin HV testing Phasing, DC OC test, OL SC test, CL SC test, E-stop checks etc.-.	**APRIL 12, 2007** - (IPSC/Alstom) 2 elect Field Exciter testing - (IPSC/Alstom) 2 elect Finish pulse testing. - (IPSC/Alstom) 2 elec Continue HV testing Phasing, DC OC test, OL SC test, CL SC test, E-stop checks etc.	**APRIL 13, 2007** - (Alstom/IPSC) Motor disconnect switch testing. - (IPSC/Alstom) 2 elec Continue HV testing Phasing, DC OC test, OL SC test, CL SC test, E-stop checks etc. - (IPSC/Alstom) complete pulse testing. - (IPSC) 2 elec general clean up of area	**APRIL 14, 2007** - (Alstom/IPSC) 1 elect Motor disconnect switch test - (IPSC/Alstom) 2 elec finish HV testing Phasing, DC OC test, OL SC test, CL SC test, E-stop checks etc. - (IPSC) sign off DNOs on O/P disconnects.	**APRIL 15, 2007** -(IPSC) Jumper ID fan dampers (bottled up rotational tests.) I&C tech - (IPSC/Alstom) 2 elec motor rotational checks/Encoder sequence testing. - encoder problem shooting (none expected) lube oil press and boiler press to permits to close 6.9kv bkrs
APRIL 16, 2007 - (IPSC/Alstom) Check A and B drives for preliminary rotation tests. -(IPSC/Alstom) set up voltage dividers on A. - (IPSC/Alstom) Begin rotation tests on A. **Requires mid-speed**	**APRIL 17, 2007** - (IPSC/Alstom) Continue to test A for proper encoder configuration tests. No load testing. Proper phase rotation on stator. - (IPSC) 2 elec electricians change all resin beads for A, B, C, D drives. -2 elec general clean up. **Requires mid-speed**	**APRIL 18, 2007** - (IPSC/Alstom) Continue with B ID fan encoder configuration tests. No load testing. Proper phase rotation on stator. - (IPSC) 2 elec electricians change all resin beads for A, B, C, D drives. -2 elec general clean up. **Requires mid-speed**	**APRIL 19, 2007** - (IPSC/Alstom) Finish B ID fan encoder configuration. No load testing. Proper phase rotation on stator. - (IPSC) 2 elec electricians terminate the 3/C #8 essential service feed on C and D drives. -1 elec laminated prints in cabs **Requires mid-speed**	**APRIL 20, 2007** - (IPSC/Alstom) ID fan encoder configuration. No load testing. Proper phase rotation on stator. - (IPSC) electricians paint and inscribe them for the drive they belong to. -clean area. -1 elec general clean up. **Requires mid-speed**	**APRIL 21, 2007** Single Channel No load testing. 2 elec all day Speed Regulator Control Speed 2 I&C all day Regulator control checks v/f control checks start/stop checks Operational and stability checks. Master/Slave chop overs **Requires mid-speed**	**APRIL 22, 2007** Single Channel No load testing. 2 elec all day Speed Regulator Control Speed Regulator control checks v/f control checks start/stop checks Operational and stability checks. Master/Slave chop overs **Requires mid-speed**

IP7015304

Commissioning Schedule for IPSC Dual Channel ID Fans (Unit 1 1A & 1B)

APRIL 23, 2007	APRIL 24, 2007	APRIL 25, 2007	APRIL 26, 2007	APRIL 27, 2007	APRIL 28, 2007	APRIL 29, 2007
- **Full load testing** **Requires Full draft** Dual Channel Full Load Tests. Beta and recovery time checks. E-Stop, master/slave chop over… Perform on all two (2) fans. Beta and recovery time checks. E-Stop,	- **Full load testing** **Requires Full draft** Heat test	- **Full load testing** **Requires Full draft** Heat test Hand over drives for ID fan 1A to Operations	- **Full load testing** **Requires Full draft** Heat test Hand over drives for ID fan 1B to Operations	- (IPSC) 2 elec. electricians to help hang grounds for safety guys installing fire masticking		
APRIL 30, 2007	**MAY 01, 2007**	**MAY 02, 2007**	**MAY 03, 2007**	**MAY 04, 2007**	**MAY 05, 2007**	**MAY 06, 2007**

IP7015305

Commissioning Schedule for IPSC Dual Channel ID Fans (Unit 1 1A & 1B)

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
MARCH 26, 2007	**MARCH 27, 2007**	**MARCH 28, 2007** - -	**MARCH 29, 2007** - Stage testing equipment for commissioning. - Phones, tables, power boards for multi-plugs, chairs, garbage pails etc.	**MARCH 30, 2007** - (CVE) stages drives. - (CVE) making sure labels on cables are taped down so not to loose them.	**MARCH 31, 2007** - (CVE) staging equipment necessary to begin extraction. - (CVE) making sure labels on cables are taped down so not to loose them.	**APRIL 01, 2007** - 6:00 am Request full clearance to be hung. - 8:00 am Sign on clearance. Request grounds to be hung. 4 elec to walk down - 9:00 am Sign on gnds. - (CVE) begins.
APRIL 02, 2007 - 1st day for CVE. (CVE) New drives in place and re-wiring begun. 2 elec support - (IPSC/ I&C) remote I/O - (CVE) Switchgear cubicles (Nathan). - (CVE) HV cable support – Link reactor and xfmr work complete. - (IPSC) Nate Verify all xfmr and link reactor work is done-HV support	**APRIL 03, 2007** - 2nd day for CVE. (CVE) Continue to re-wire new drives. - (CVE) Begin to verify wiring of drives. 2 elec - (CVE) Verify all HV connections are same as before. 2 elect - (CVE) finish switchgear wiring. - (Nate)Verify. -(CVE) finishes work at midnight. (Three-24 hour periods given to CVE).	**APRIL 04, 2007** - 8:00 am Alter clearance to give 480V and 120V for cabinet lights, rcptcl. pump and cntrl power. - (Alstom/IPSC) inspects installation. Wiring checks 4 elec - (Alstom/IPSC) begin to re-connect shipping splits. *Tight connections* - (IPSC) 2 elec start on one drive fill cooling systems with DI. Check for freeze damage in tank	**APRIL 05, 2007** - (Alstom/IPSC) Complete shipping split re-connection 1-elect. - (Alstom/IPSC) All electrical connections are to be tightened 1 elec. - (IPSC) electricians fill cooling systems on all drives complete 2 elec. - (IPSC) check for (leaks). -fix leaks and re-fill 2 elec.	**APRIL 06, 2007** - (IPSC/Alstom) 2 elec - Low voltage power-up checks. - (IPSC/Alstom) 2 elec all day encoder wrg open exciter housing and verify all parts are tight. - (Nate) Verify all wiring in Remote I/O cabinets. - (IPSC/Alstom) 2 elec – If complete with low voltage power-up checks. Start with I/O verification.	**APRIL 07, 2007** - (IPSC/Alstom) Low voltage power up checks. - (IPSC/Alstom) I/O checks on all ID fan drives. - (IPSC/Alstom) complete encoder wrg. Close down the exc housing. Evening-ask for HV caution tags on 6.9kv O/P still DNO'ed. sign off if we can to have clearance ready for Monday morn.	**APRIL 08, 2007** Easter
APRIL 09, 2007 - Morning Sign on clearance cautions on 6.9kv. OK TO HOT ALERT 6.9KV - (IPSC/Alstom)2 elec finish I/O checks on A drives. - (IPSC/Alstom) 2 elec finish encoder wiring and close all exciter housing.	**APRIL 10, 2007** -(IPSC/Alstom) finish all I/O checks on B drives. - (Alstom /Relay Techs) Start HV trip testing (A & B drives). (Need relay techs) ALERT 6.9KV - (IPSC/Alstom) HV (IPSC/Alstom) 2 elect Thorough pulse tests on all drives.	**APRIL 11, 2007** (IPSC/Alstom) 2 elec pulse tests on all drives. (IPSC/Alstom) 2 elect modifies back panel doors (top bolt). - (IPSC/Alstom) 2 elec Begin HV testing Phasing, DC OC test, OL SC test, CL SC test, E-stop checks etc.-.	**APRIL 12, 2007** - (IPSC/Alstom) 2 elect Field Exciter testing - (IPSC/Alstom) 2 elect Finish pulse testing. - (IPSC/Alstom) 2 elec Continue HV testing Phasing, DC OC test, OL SC test, CL SC test, E-stop checks etc.	**APRIL 13, 2007** - (Alstom/IPSC) Motor disconnect switch testing. - (IPSC/Alstom) 2 elec Continue HV testing Phasing, DC OC test, OL SC test, CL SC test, E-stop checks etc. - (IPSC/Alstom) complete pulse testing. - (IPSC) 2 elec general clean up of area	**APRIL 14, 2007** - (Alstom/IPSC) 1 elect Motor disconnect switch test - (IPSC/Alstom) 2 elec finish HV testing Phasing, DC OC test, OL SC test, CL SC test, E-stop checks etc. - (IPSC) sign off DNOs on O/P disconnects.	**APRIL 15, 2007** -(IPSC) Jumper ID fan dampers (bottled up rotational tests.) I&C tech - (IPSC/Alstom) 2 elec motor rotational checks/Encoder sequence testing. - encoder problem shooting (none expected)
APRIL 16, 2007 - (IPSC/Alstom) Check A and B drives for preliminary rotation tests. -(IPSC/Alstom) set up voltage dividers on A. - (IPSC/Alstom) Begin rotation tests on A. **Requires mid-speed**	**APRIL 17, 2007** - (IPSC/Alstom) Continue to test A for proper encoder configuration tests. No load testing. Proper phase rotation on stator. - (IPSC) 2 elec electricians change all resin beads for A, B, C, D drives. -2 elec general clean up. **Requires mid-speed**	**APRIL 18, 2007** - (IPSC/Alstom) Continue with B ID fan encoder configuration tests. No load testing. Proper phase rotation on stator. - (IPSC) 2 elec electricians change all resin beads for A, B, C, D drives. -2 elec general clean up. **Requires mid-speed**	**APRIL 19, 2007** - (IPSC/Alstom) Finish B ID fan encoder configuration. No load testing. Proper phase rotation on stator. - (IPSC) 2 elec electricians terminate the 3/C #8 essential service feed on C and D drives. -1 elec laminated prints in cabs **Requires mid-speed**	**APRIL 20, 2007** - (IPSC/Alstom) ID fan encoder configuration. No load testing. Proper phase rotation on stator. - (IPSC) electricians paint and inscribe them for the drive they belong to. -clean area. -1 elec general clean up. **Requires mid-speed**	**APRIL 21, 2007** Single Channel No load testing. 2 elec all day Speed Regulator Control Speed 2 I&C all day Regulator control checks v/f control checks start/stop checks Operational and stability checks. Master/Slave chop overs **Requires mid-speed**	**APRIL 22, 2007** Single Channel No load testing. 2 elec all day Speed Regulator Control Speed Regulator control checks v/f control checks start/stop checks Operational and stability checks. Master/Slave chop overs **Requires mid-speed**

IP7015306

Commissioning Schedule for IPSC Dual Channel ID Fans (Unit 1 1A & 1B)

APRIL 23, 2007	APRIL 24, 2007	APRIL 25, 2007	APRIL 26, 2007	APRIL 27, 2007	APRIL 28, 2007	APRIL 29, 2007
- **Full load testing Requires Full draft** Dual Channel Full Load Tests. Beta and recovery time checks. E-Stop, master/slave chop over… Perform on all three (3) fans. Beta and recovery time checks. E-Stop,	- (IPSC) 2 elec electricians to help hang grounds for safety guys installing fire masticking.					
APRIL 30, 2007	**MAY 01, 2007**	**MAY 02, 2007**	**MAY 03, 2007**	**MAY 04, 2007**	**MAY 05, 2007**	**MAY 06, 2007**

ID FAN OUTAGE MEETING
APRIL 2007

March 20, 2007

1. Daily schedule

- I will hand out my tentative schedule and go through it day by day.
  Special notes: (Encoder ring holder to be modified 3.5 inches CW)
  (Plumbing the shipping splits together)
  (Wire checking and tightening)
  (High voltage apparel-hot stick)

2. Quality assurance.

- With an outside contractor doing the installation there is motivation for meticulously checking all wiring.

3. Safety.

- I will hand out the clearance schedule for the outage and discuss the special testing procedures with them. ie. OK TO HOT conditions.

4. Discussion on preparedness for the outage.

- Suggest things that will help us be more prepared and efficient with our time. ie. Each electrician gets his own outage package (dwgs and such).

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
26-Mar-07	**27-Mar-07**	**28-Mar-07**	**29-Mar-07**	**MARCH 30, 2007**	**MARCH 31, 2007**	**APRIL 01, 2007**
			- Stage testing equipment for commissioning.	- (CVE) stages drives.	- (CVE) staging equipment necessary to begin extraction.	- 6:00 am Request full clearance to be hung.
		-	- Phones, tables, power boards for multi plugs, chairs, garbage pails etc.	- (CVE) making sure labels on cables are taped down so not to loose them.	- (CVE) making sure labels on cables are taped down so not to loose them. **(ipsc to megger mtrs & adjust encoder rings)**	- 8:00 am Sign on clearance. Request grounds to be hung. 4 elec to walk down
		-				- 9:00 am Sign on gnds. - (CVE) begins.
APRIL 02, 2007	**APRIL 03, 2007**	**APRIL 04, 2007**	**APRIL 05, 2007**	**APRIL 06, 2007**	**APRIL 07, 2007**	**APRIL 08, 2007**
- 1st day for CVE.	- 2nd day for CVE. (CVE) Continue to re-wire new drives.	- 8:00 am Alter clearance to give 480V and 120V for cabinet lights, rcptcl. pump and cntrl power.	- (Alstom/IPSC) Complete shipping split re-connection 1-elect.	- (IPSC/Alstom) 2 elec -Low voltage power-up checks.	- (IPSC/Alstom) Low voltage power up checks.	
(CVE) New drives in place and re-wiring begun. 2 elec support	- (CVE) Begin to verify wiring of drives. 2 elec	- (Alstom/IPSC) inspects installation. Wiring checks 4 elec - (Alstom/IPSC) begin to re-connect shipping splits. *Tight connections*	- (Alstom/IPSC) All electrical connections are to be tightened 1 elec.	- (IPSC/Alstom) 2 elec all day encoder wrg open exciter housing and verify all parts are tight.	- (IPSC/Alstom) I/O checks on all ID fan drives.	
- (IPSC/ I&C) remote I/O	- (CVE) Verify all HV connections are same as before. 2 elect	- (IPSC) 2 elec start on one drive fill cooling systems with DI. Check for freeze damage in tank	- (IPSC) electricians fill cooling systems on all drives complete 2 elec.	- (Nate) Verify all wiring in Remote I/O cabinets.	- (IPSC/Alstom) complete encoder wrg.	Easter

- (CVE) Switchgear cubicles (Nathan). - (CVE) HV cable support – Link reactor and xfmr work complete. - (IPSC) Nate Verify all xfmr and link reactor work is done-HV support	- (CVE) finish switchgear wiring. - (Nate)Verify. -(CVE) finishes work at midnight. (Three-24 hour periods given to CVE).		- (IPSC) check for (leaks). -fix leaks and re-fill 2 elec.	- (IPSC/Alstom) 2 elec –If complete with low voltage power-up checks. Start with I/O verification.	Close down the exc housing. Evening-ask for HV caution tags on 6.9kv O/P still DNO'ed. sign off if we can to have clearance ready for Monday morn.	
APRIL 09, 2007	**APRIL 10, 2007**	**APRIL 11, 2007**	**APRIL 12, 2007**	**APRIL 13, 2007**	**APRIL 14, 2007**	**APRIL 15, 2007**
- Morning Sign on clearance cautions on 6.9kv. OK TO HOT ALERT 6.9KV - (IPSC/Alstom)2 elec finish I/O checks on A drives. - (IPSC/Alstom) 2 elec finish encoder wiring and close all exciter housing.	-(IPSC/Alstom) finish all I/O checks on B drives. - (Alstom /Relay Techs) Start HV trip testing (A & B drives). (Need relay techs) ALERT 6.9KV - (IPSC/Alstom) HV (IPSC/Alstom) 2 elect Thorough pulse tests on all drives.	(IPSC/Alstom) 2 elec pulse tests on all drives. (IPSC/Alstom) 2 elec modifies back panel doors (top bolt). - (IPSC/Alstom) 2 elec Begin HV testing Phasing, DC OC test, OL SC test, CL SC test, E-stop checks etc.-.	- (IPSC/Alstom) 2 elect Field Exciter testing - (IPSC/Alstom) 2 elect Finish pulse testing. - (IPSC/Alstom) 2 elec Continue HV testing Phasing, DC OC test, OL SC test, CL SC test, E-stop checks etc.	- (Alstom/IPSC) Motor disconnect switch testing. - (IPSC/Alstom) 2 elec Continue HV testing Phasing, DC OC test, OL SC test, CL SC test, E-stop checks etc. - (IPSC/Alstom) complete pulse testing. - (IPSC) 2 elec general clean up of area	- (Alstom/IPSC) 1 elect Motor disconnect switch test - (IPSC/Alstom) 2 elec finish HV testing Phasing, DC OC test, OL SC test, CL SC test, E-stop checks etc. - (IPSC) sign off DNOs on O/P disconnects.	-(IPSC) Jumper ID fan dampers (bottled up rotational tests.) I&C tech - (IPSC/Alstom) 2 elec motor rotational checks/Encoder sequence testing. - encoder problem shooting (none expected) lube oil press and boiler press to permits to close 6.9kv bkrs
APRIL 16, 2007	**APRIL 17, 2007**	**APRIL 18, 2007**	**APRIL 19, 2007**	**APRIL 20, 2007**	**APRIL 21, 2007**	**APRIL 22, 2007**

- (IPSC/Alstom) Check A and B drives for preliminary rotation tests.	- (IPSC/Alstom) Continue to test A for proper encoder configuration tests. No load testing. Proper phase rotation on stator.	- (IPSC/Alstom) Continue with B ID fan encoder configuration tests. No load testing. Proper phase rotation on stator.	- (IPSC/Alstom) Finish B ID fan encoder configuration. No load testing. Proper phase rotation on stator.	- (IPSC/Alstom)	Single Channel No load testing. 2 elec all day	Single Channel No load testing. 2 elec all day
-(IPSC/Alstom) set up voltage dividers on A.	- (IPSC) 2 elec electricians change all resin beads for A, B, C, D drives.	- (IPSC) 2 elec electricians change all resin beads for A, B, C, D drives.	- (IPSC) 2 elec electricians terminate the 3/C #8 essential service feed on C and D drives.	ID fan encoder configuration. No load testing. Proper phase rotation on stator.	Speed Regulator Control	Speed Regulator Control
- (IPSC/Alstom) Begin rotation tests on A.	-2 elec general clean up.	-2 elec general clean up.	-1 elec laminated prints in cabs	- (IPSC) electricians paint and inscribe them for the drive they belong to.	Speed 2 I&C all day	Speed
Requires mid-speed	**Requires mid-speed**	**Requires mid-speed**	**Requires mid-speed**	-clean area. -1 elec general clean up. **Requires mid-speed**	Regulator control checks v/f control checks start/stop checks Operational and stability checks. Master/Slave chop overs **Requires mid-speed**	Regulator control checks v/f control checks start/stop checks Operational and stability checks. Master/Slave chop overs **Requires mid-speed**
APRIL 23, 2007	**APRIL 24, 2007**	**APRIL 25, 2007**	**APRIL 26, 2007**	**APRIL 27, 2007**	**APRIL 28, 2007**	**APRIL 29, 2007**
- Full load testing **Requires Full draft**	**- Full load testing** **Requires Full draft**	**- Full load testing** **Requires Full draft**	**- Full load testing** **Requires Full draft**	- (IPSC) 2 elec. electricians to help hang grounds for safety guys installing fire masticking		
Dual Channel Full Load Tests. Beta and recovery time checks. E-Stop, master/slave chop over… Perform on all two (2) fans. Beta and recovery time checks. E-Stop,	Heat test	Heat test Hand over drives for ID fan 1A to Operations	Heat test Hand over drives for ID fan 1B to Operations			

APRIL 30, 2007	MAY 01, 2007	MAY 02, 2007	MAY 03, 2007	MAY 04, 2007	MAY 05, 2007	MAY 06, 2007

From: Mikhail Zakin <mzakin@yahoo.com>
To: <steve.klein@converteam.com>
Date: 4/17/2007 10:22 AM
Subject: Re: IPP daily report

CC: <david.simoni@converteam.com>, Nathan Crop <nathan-c@IPSC.com>, <siddhar...

Steve,
That is fine. You may send us that suppressor and we'll install it. I didn't say that relay is wrong but I stated that it is different then rest of them in other drives . Because of its smaller size we can't plug a 3RT1916-1CD00 suppressor in.
Regards,

Mikhail, Denny

P.S. Are we getting a new type 'C' PIB? We have no more spare type 'C' here.

----- Original Message ----
From: "steve.klein@converteam.com" <steve.klein@converteam.com>
To: Mikhail Zakin <mzakin@yahoo.com>
Cc: david.simoni@converteam.com; Nathan Crop <nathan-c@IPSC.com>; siddharth.pant@converteam.com
Sent: Tuesday, April 17, 2007 9:24:33 AM
Subject: Re: IPP daily report

Mikhail,

The problem with drive 1B1 is that you have the wrong suppressor, not the wrong relay. The correct suppressor is part no. 3TX4490-3H and we should have extra pieces here to ship out tonight. I discussed this both with Sid and manufacturing personnel. This is the only drive where this problem exists.

Please let me know that you are in agreement with this and I will send the suppressor via overnight air freight.

Regards,

Steve

Mikhail Zakin <mzakin@yahoo.com > To: Siddharth PANT/USPIT01/APC@APC, Steve KLEIN/USPIT01/APC@APC
cc: David SIMONI/USPIT01/APC@APC, Nathan Crop <nathan-c@IPSC.com>
Subject: IPP daily report

Phone:
04/15/2007 11:32 PM

Ahhh...imagining that irresistible "new car" smell?
Check out new cars at Yahoo! Autos.

>> log_IPP_14_Apr_07.doc removed by Steve KLEIN on 17 April 2007
>> log_IPP_15_Apr_07.doc removed by Steve KLEIN on 17 April 2007

:._____

CONVERTEAM
THE POWER CONVERSION COMPANY

ENGINEER'S DAILY SITE LOG

No: IPP/02_Apr_07
Day: Monday
Date: 02 April 07
Contract No: GD70116

Contract: Intermountain Power Projects – ID Fans Upgrade
Work Area: Unit 1 Shutdown – ID Fan commissioning

WORK AREA	DESCRIPTION OF WORK CARRIED OUT/ PROBLEMS	Time
Travel	o Travel to site.	
Keep track of hours	MRZ: 12hrs DJC: 12hrs	

Signed: Mikhail Zakin, Denny Ciramella

Name: Mikhail Zakin, Denny Ciramella

ALSTOM Power Conversion
610 Epsilon Drive
Pittsburgh, PA 15238
www.alstom.com

CONVERTEAM
THE POWER CONVERSION COMPANY

ENGINEER'S DAILY SITE LOG

No: IPP/03_Apr_07
Day: Tuesday
Date: 03 April 07
Contract No: GD70116

Contract: Intermountain Power Projects – ID Fans Upgrade
Work Area: Unit 1 Shutdown – ID Fan commissioning

WORK AREA	DESCRIPTION OF WORK CARRIED OUT/ PROBLEMS	Time
IPP Safety Induction	o Safety Induction: Mikhail Zakin & Dennis Ciramella	
Site Status	o Wiring still in progress, no major problem to report.	
Site Prep	o Setup working area, storage area for tools and test equipment. o Setup latest Sigma Program from Sid Pant on Mikhail Zakin & Dennis Ciramella's commissioning laptops.	
Motor cables	o Proved cables between drive, disconnect switch, and motor by disconnecting cables at motors and checking continuity with ohm-meter by shorting each cable to ground.. o Cables are connected as follows: **Unit 1** For clockwise rotation drives (Fan A & Fan B) Channel 1: Drive End — Cable — Motor End (terminal box or "Peckerhead") T1----------(Brown 'A')----------→T1 '1' (right when looking into motor) T2----------(Orange 'B')----------→T2 '2' (center when looking into motor) T3----------(Yellow 'C')----------→T3 '3' (left when looking into motor) Channel 2: Drive End — Cable — Motor End (terminal box or "Peckerhead") T1----------(Brown 'A')----------→T7 '1' (right when looking into motor) T2----------(Orange 'B')----------→T8 '2' (center when looking into motor) T3----------(Yellow 'C')----------→T9 '3' (left when looking into motor) **Already commissioned in 2006 Unit 2 drives:** For clockwise rotation drives (Fan A & Fan B) Channel 1: Drive End — Cable — Motor End (terminal box or "Peckerhead") T1----------(Brown 'A')----------→T1 '1' (left when looking into motor) T2----------(Orange 'B')----------→T2 '2' (center when looking into motor) T3----------(Yellow 'C')----------→T3 '3' (right when looking into motor) Channel 2: Drive End — Cable — Motor End (terminal box or "Peckerhead") T1----------(Brown 'A')----------→T7 '1' (left when looking into motor) T2----------(Orange 'B')----------→T8 '2' (center when looking into motor) T3----------(Yellow 'C')----------→T9 '3' (right when looking into motor) Right now the cables orientation at the Motor Peckerhead is reversed on Unit 1. At present customer (Nathan Crop) doesn't wont to change wiring to match existing commissioned last year Unit 2. His reason is that he already set the encoders. We have not check the encoders yet but we think that all Units should be wired the same.	
SCR modules torque	o Checked torque indicator washers on each SCR module o All 6 SCR modules in the drives 1A1 and 1A2 as well as 2 top SCR modules in the drive 1B1 were found undertorqued (indicator washer wouldn't move). We torque all SCR modules properly that indicator washer become loose. .	
Dip switches and jumpers.	o Verified settings for switches and jumpers according to the prints on all Customer I/O boards, PDP boards, PAB boards and SPANG exciter controller.	
Travel	o - Travel from Nephi to IPP –60 miles each way	
Keep track of hours	MRZ: 12hrs DJC: 12hrs	

Signed: Mikhail Zakin, Denny Ciramella

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ENGINEER'S DAILY SITE LOG

No: IPP/04_Apr_07
Day: Wednesday
Date: 04 April 07
Contract No: GD70116

Contract: Intermountain Power Projects – ID Fans Upgrade
Work Area: Unit 1 Shutdown – ID Fan commissioning

WORK AREA	DESCRIPTION OF WORK CARRIED OUT/ PROBLEMS	Time
Site Status	o Wiring is complete by end of the day.	
Fuses and breakers	o All fuses and breakers verified according to the prints. o Bad (open) fuse was found in PT2 (Stator Voltage Feedback Transformer HV side) in 1B1 drive. o The fuse was replaced with good one (1E Amp.) from the customer's spares. o The fuses FS11,12,13,14 and FSP1,2,3,4 have location reversed (the wiring is correct) in the Regulator cabinet drive 1A2.	
Shipping splits	o Wires connected on all shipping split terminals in each drive. o All ribbon cables and fiber optic cables (disconnected for shipping) connected. o All current feedback wires (disconnected for shipping) from CTs connected.	
Cooling System shipping splits	o All Cooling System shipping splits connected except one T unit (marked as: Supply For Power Section) in the drive 1B2. That part is missing from the Converteam shipping. o We called Dave Simoni and asked him to expedite that piece of plumbing to us ASAP. We can't fill the drive with water before we get the missing part.	
Clearance	o We signed off all of the clearances so that Nathan can bring 120 V and 480 V power to the drive tonight. o HV clearance will be signed in again tomorrow morning.. o	
Travel	o Travel from Nephi to IPP and back to Nephi – 60 miles each way	
Keep track of hours	MRZ: 12hrs DJC: 12hrs	

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ENGINEER'S DAILY SITE LOG

No: IPP/05_Apr_07
Day: Thursday
Date: 05 April 07
Contract No: GD70116

Contract: Intermountain Power Projects – ID Fans Upgrade
Work Area: Unit 1 Shutdown – ID Fan commissioning

WORK AREA	DESCRIPTION OF WORK CARRIED OUT/ PROBLEMS	Time
Site Clearance	o Signed on 6900 V Clearances.	
Installations	o Plant wiring to the drive cubicles completed by the Electrical Contractor.	
Shipping–split interconnections	o Electrical inter–connections completed. Plumbings inter–connections completed except in the drive 1B2 (CPVC part is missing)	
Low Voltage Supply and checks	o 120 VAC ESS power (former UPS) from the customer, 480 VAC power from the customer, 120 VAC normal power supply from the customer, and 208 VAC to motor space heaters (channel 1 drives only) were measured at the drive's terminals and were written down into the Commissioning Manual. o The Fuses and breakers were closed according to the Commissioning Manual. o Sigma regulator, HMI, SPANG exciter and Gating power supply were powered up. o Download and run the Sigma application program in the controller. o Download the HMI code.	
Water Cooling	o Filled 3 water-cooling systems with de-ionized water. o Found and fixed one leak in the drive 1A2 at the shipping split. Pinched o-ring was to blame for that. The water was drained out and O-ring was replaced with the spare one. o The drive 1A2 was refilled wit de-ionized water. o Set and calibrated 4 Honeywell Conductivity Analyzers according to the Commissioning Manual. o De-aired water-cooling systems in each of 3 drives. o Nathan made a decision to leave the drives running overnight if no leaks will be seen by time we will be finishing to work. o No leaks were spotted and the drives were left running overnight.	
Travel	o Travel from Nephi to IPP and back to Nephi – 60 miles each way	
Keep track of hours	MRZ: 12hrs DJC: 12hrs	

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ENGINEER'S DAILY SITE LOG

No: IPP/06_Apr_07
Day: Friday
Date: 06 April 07
Contract No: GD70116

Contract: Intermountain Power Projects – ID Fans Upgrade
Work Area: Unit 1 Shutdown – ID Fan commissioning

WORK AREA	DESCRIPTION OF WORK CARRIED OUT/ PROBLEMS	Time
Site safety	o Morning safety briefing for commissioning crew conducted by M Z..	
Water Cooling	o Missing CPVC part was delivered on site and installed in the drive 1B2. o Filled drive's 1B2 water-cooling system with de-ionized water. o De–aired water-cooling system in the drive 1B2. o Checked all drives for leaks. No leaks were found. o Checked and set (by using needle valves) water flow through water cooled resistors and through SCR module in each drive. o Wrote the flow values for each drive into Commissioning Manual (>1.00GPM for water cooled resistors and > then 1.5 GPM for SCR Modules).	
Needle Valve Manifold	o Manifold in all drives were sagging causing pressure on quick disconnect against conduit run. This caused quick disconnect to not seat properly and leak. Problem was corrected by supporting manifold. **NOTE: this was same problem last year, which was stated in site report. Problem still exists and needs attention.**	
Digital Inputs.	o Tested all but two Digital Inputs in each drive.	
Loose wire connections.	o Loose wire connection was found on OC6 – wire #1030 in the Regulator cabinet. o Another loose wire was found on GFR relay – wire # 1019B in the Machine Incomer cabinet.	
HMI	o Enable Time Manager by Nathan's request. o Set proper IP address for each drive	
Keep track of hours	MRZ: 14hrs DJC: 14hrs	

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ENGINEER'S DAILY SITE LOG

No: IPP/07_Apr_07
Day: Saturday
Date: 07 April 07
Contract No: GD70116

Contract: Intermountain Power Projects – ID Fans Upgrade
Work Area: Unit 1 Shutdown – ID Fan commissioning

WORK AREA	DESCRIPTION OF WORK CARRIED OUT/ PROBLEMS	Time
Site safety	o Morning safety briefing for commissioning crew conducted by M Z..	
Digital Inputs.	o Finished testing of the digital Inputs in all 4 drives.	
Digital Outputs	o Tested all digital outputs in 4 drives.	
Diagnostic Serial Links	o Checked Diagnostic Serial Link according to the Commissioning Instruction in all drives.	
Hardware O/C test	o Tested Hardware Overcurrent Circuit according to the Commissioning Instruction in all drives. o Recorded the DC voltage level at which the drive indicated over current trip.	
No HV Firing Pulse Check	o This test was performed with the main AC power input breaker open. o The test was done according with the Commissioning Instruction in all drives. o The results were saved in the commissioning Laptop by using the Wavestar software.	
Spang controller	o Spang exciter controller unit in the drive 1A1 has latched on Internal Fault 11 (Phase L1 loss). o We replaced that Spang (SN: A05017412-004) with the customer's spare Spang exciter controller (SN: A04106948-001). o Nathan will call Pittsburgh Monday to get RMA No and then he'll ship the Spang to Pittsburgh for repair or replacement.	
Cabinet wiring	o Loose wire # 1260 was found on SOR (slave output relay) relay in the drive 1B2. o Wire # 225 was wrongly connected to the terminal 16 instead of terminal 18 on GFR (ground fault relay) in the drive 1A1. o We corrected the problems. o Also wires in each drive are daisy chained differently which is confusing. **NOTE: this was same problem last year, which was stated in site report. Problem still exists and needs attention.** .	
Keep track of hours	MRZ: 14hrs DJC: 14hrs	

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ENGINEER'S DAILY SITE LOG

No: IPP/08_Apr_07
Day: Sunday
Date: 08 April 07
Contract No: GD70116

Contract: Intermountain Power Projects – ID Fans Upgrade
Work Area: Unit 1 Shutdown – ID Fan commissioning

WORK AREA	DESCRIPTION OF WORK CARRIED OUT/ PROBLEMS	Time
Site safety	o Morning safety briefing for commissioning crew conducted by M Z..	
Analog I/O	o Checked the operation and feedback scaling of the analog inputs, outputs for all drives. o Verified each analog I/O signal with the temporary control cabinets (DCS will be brought on line by the end of outage) in the new control operation room. INC technician and Nathan Crop were helping us in the control room.	
Type C PIB	o Plug 317 (Analog Outputs) on type C PIB was not plugged in firmly (it was hardly touching) in the drive 1A2. That was found while we were troubleshooting loss of Analog Output signals.	
Exciter reference check	o Exciter in the drive 1B2 is commissioned to the point when output cables to the motor needs to be connected. o We will not to able to connect exciter output cables in any of the drives until Thursday because people are working on the Fan blades.	
FCN wiring	o FCN (Field Contactor) wiring between the drives is incorrect (field Wires on TB3 in the control cabinet) and should be corrected by IPP electricians in all drives.	
Water cooling	o Two small leaks were found at the shipping splits in the drive 1B2.	
Keep track of hours	MRZ: 12hrs DJC: 12hrs	

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ENGINEER'S DAILY SITE LOG

No: IPP/09_Apr_07
Day: Monday
Date: 09 April 07
Contract No: GD70116

Contract: Intermountain Power Projects – ID Fans Upgrade
Work Area: Unit 1 Shutdown – ID Fan commissioning

WORK AREA	DESCRIPTION OF WORK CARRIED OUT/ PROBLEMS	Time
Site safety	o Morning safety briefing for commissioning crew conducted by M Z.	
Exciter reference check	o Exciters in the drive 1B1, 1A1, and 1A2 were commissioned to the point when output cables to the motor needed to be connected. o We will not to able to connect exciter output cables in any of the drives until Thursday (according to Nathan) because IPSC people are working on the Fan blades.	
FCN wiring	o Helped IPSC technicians to sort out FCN (Field Contactor) wiring between the channel 1 and channel 2drives. o Tested FCN operations in each drive.	
Water cooling	o The water was drained out from the drive 1B2. o O-rings were replaced in two shipping splits (on supply and on return path) in the Machine Inverter Cabinet. o Refilled the drive with water. o Started the water-cooling pump and checked for leaks. o There were no leaks so far.	
6900 V clearance	o 6.9kV clearance can't be removed today for us to start HV checking and testing on the drives. o IPSC is working on the Fans blades repair (welding and grinding). They should be done with that work later tonight.	
Overhead work	o On site contractors are insulating overhead pipes above the A and B drives. o We requested them (through Nathan) not to work above any of the commissioning drives after the 6.9 kV clearances will be removed.	
Keep track of hours	MRZ: 10 DJC: 10	

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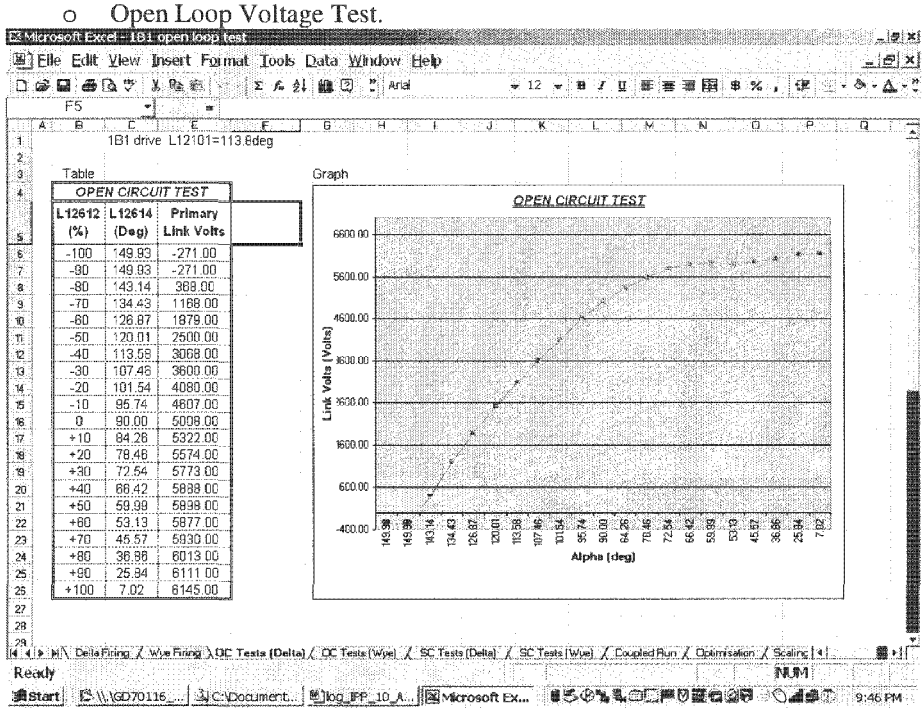
ENGINEER'S DAILY SITE LOG

No: IPP/09_Apr_07
Day: Tuesday
Date: 10 April 07
Contract No: GD70116

Contract: Intermountain Power Projects – ID Fans Upgrade
Work Area: Unit 1 Shutdown – ID Fan commissioning

WORK AREA	DESCRIPTION OF WORK CARRIED OUT/ PROBLEMS	Time
Site safety	o Safety precautions for 6900 V clearances. o Morning safety briefing for commissioning crew conducted by M.Z.	
6900 V clearance	o Signed on 6.9 kV clearance for Unit 1 A and B drives.	
1A1 drive Supply Phase Sequence problem	o Set O-scope to check Supply Phase Sequence for the drive 1A1 using 100:1 HV divider. o Test showed us that Supply Phase Sequence is B-A-C instead of A-B-C. o On site contractors who were doing the cabling left site already. o IPCS electricians will correct the problem	
1B1 drive HV testing	o Verified that Supply Phase Sequence is correct (A-B-C). o Fast phaseback timing check: 37.9 msec (average of 3 tests). o Phasing Check: L12101=113.8deg (same as for the drives previously commissioned drives) o Open Loop Voltage Test. 	
Keep track of hours	MRZ: 14 DJC: 14	

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ENGINEER'S DAILY SITE LOG

No: IPP/09_Apr_07
Day: Wednesday
Date: 11 April 07
Contract No: GD70116

Contract: Intermountain Power Projects – ID Fans Upgrade
Work Area: Unit 1 Shutdown – ID Fan commissioning

WORK AREA	DESCRIPTION OF WORK CARRIED OUT/ PROBLEMS	Time
Site safety	o Safety precautions for 6900 V clearances. o Morning safety briefing for commissioning crew conducted by M.Z.	
6900 V clearance	o Continued to work on 6.9 kV clearances for Unit 1 A and B drives.	
1A1 drive Supply Phase Sequence problem	o Phase sequence problem was corrected at the secondary side of the 1A1 supply transformer. o Cables are connected correctly, but are not marked with the right color tape .	
1A1, drive HV testing	o Verified that Supply Phase Sequence is correct (A-B-C). o Fast phaseback timing check: 37.8 msec (average of 3 tests). o Phasing Check: L12101=113.8deg (same as for the drives previously commissioned drives) o Open Loop Voltage Test. o All results documented	
1B2, drive HV testing	o Verified that Supply Phase Sequence is correct (A-B-C). o Fast phaseback timing check: 41.3 msec (average of 3 tests). o Phasing Check: L12101=113.8de g (same as for the drives previously commissioned drives) o Open Loop Voltage Test. o All results documented.	
Water - cooling	o Both A drives developed leaks on all Needle Valves. o The customer chilling water was very cold and also HVAC man left bypass valves open. o That caused the Needle valve seals to leak. o We fixed the leaks by tightening the collar nut on the valve. o We might need to replace one or two of the valves yet if the leaks will appear again. We need couple of Needle Valves to be send on site from PGH. o The water flow was rechecked and the Needle Valves were set to the flow GT 1.0 GPM trough water-cooled resistors.	
Keep tack of hours	MRZ: 12hrs DJC: 12hrs.	

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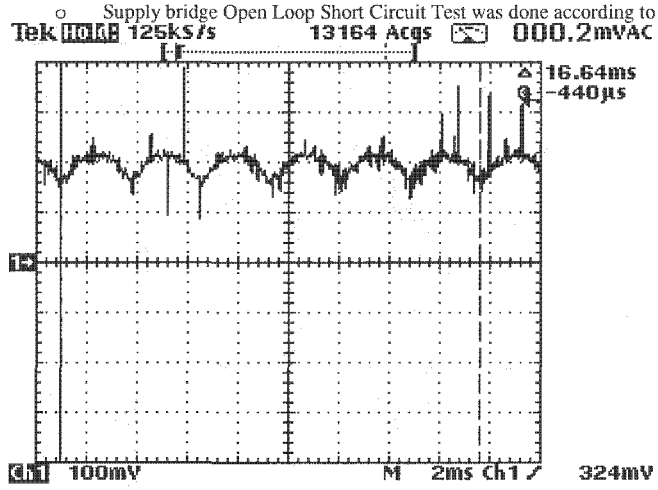
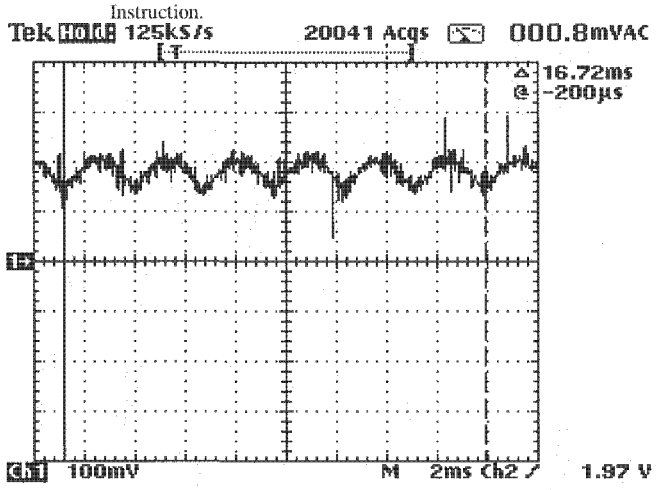
ENGINEER'S DAILY SITE LOG

No:IPP/13_Apr_07
Day: Friday
Date:13 April 07
Contract NGD70116Contract: Intermountain

Power Projects – ID Fans Upgrade
Work Area: Unit 1 Shutdown – ID Fan commissioning

WORK AREA	DESCRIPTION OF WORK CARRIED OUT/ PROBLEMS	Time
Site safety	o Morning safety briefing for commissioning crew conducted by M.Z.	
6900 V clearance	o Continued to work on 6.9 kV clearances for Unit 1 A and B drives.	
1B1 drive Short Circuit test	o Supply bridge Open Loop Short Circuit Test was done according to the commissioning Instruction  o Results were documented.	
1B2 drive Short Circuit test	o Supply bridge Open Loop Short Circuit Test was done according to the commissioning Instruction.  o Results were documented.	
Type 'C" PIB	o Type 'C' PIB was replaced with the spare board during the Short Circuit Test in the drive 1B2. o The problem is : No Supply Current Feedback passing through the board. o The board was shipped back to Pittsburgh today. o No more spare Type 'C' board present on site now.	
Spang exciter controller unit	o The customer let us to connect motor output cables from the Exciter in the 1A1 and 1A2 drives. o Calibrated current outputs in both 1A1 and 1A2 drives according with the Commissioning Instruction..	
Keep tack of hours	MRZ: 12hrs DJC: 12hrs.	

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ENGINEER'S DAILY SITE LOG

No:IPP/14_Apr_07
Day: Saturday
Date: 14 April 07

Contract NGD70116Contract: Intermountain Power Projects – ID Fans Upgrade
Work Area: Unit 1 Shutdown – ID Fan commissioning

WORK AREA	DESCRIPTION OF WORK CARRIED OUT/ PROBLEMS	Time
Site safety	o Morning safety briefing for commissioning crew conducted by M.Z.	
6900 V clearance	o Signed off 6.9 kV clearance for the Unit 1 ID Fan A and B. o Signed on 6.9 kV clearance for Unit 1 ID Fan A.	
ECN 008A	o Completed installation of suppressors on relay/contactors in each Unit 1 drive except the drive 1C1 (drive is running for air draft to the boiler) as per ECN 008A.	
ECN 008A: drive 1B1	o We couldn't plug in suppressor 3RT1916-1CD00 in to relay **P1C** in the drive 1B1 because that relay is type: Siemens 3TF2010-0AK6 instead of type: Siemens EN60-947-4-1. o Installed relay has different size and we couldn't to plug the suppressor in. o Right relay should be sent on site and installed in the 1B1 drive.	
Type 'C" PIB	o Type 'C' PIB was replaced with the spare board during the Short Circuit Test in the drive 1B2 yesterday. o Hardware Overcurrent test was repeated for new type 'C' PIB.	
Motor Disconnect	o Safety Tags were removed from both Motor Disconnects in the drive 1A1 and 1A2, o DC power for Disconnect motors was provided by the Unit 1 control. o Both activities named above took about 5 hours to implement. o Tested Motor Disconnect Switch for the drive 1A2 – OK. o The motor Disconnect for the drive 1A1 would close and wouldn't open after that. o After few hours of the troubleshooting we found few wiring mistakes in the field wires between the drive and Motor Disconnect. o Corrected the wiring and tested the Disconnect – OK.	
Keep tack of hours	MRZ: 14hrs DJC: 14hrs.	

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ENGINEER'S DAILY SITE LOG

No:IPP/15_Apr_07
Day: Sunday
Date: 15 April 07

Contract NGD70116Contract: Intermountain Power Projects – ID Fans Upgrade
Work Area: Unit 1 Shutdown – ID Fan commissioning

WORK AREA	DESCRIPTION OF WORK CARRIED OUT/ PROBLEMS	Time
Site safety	o Morning safety briefing for commissioning crew conducted by M.Z.	
6900 V clearance	o Continued to work under the 6.9 kV clearance for the ID Fan A.	
Single Channel No-Load Test	o Safety inspection - OK. o Motor Lube Oil inspection - OK. o Damper closed inspection – OK.	
Encoder setting and field wiring problems	o When attempting to start channels, 1A1 and 1A2 we were unable to turn motor. We had several encoder faults. As per customer instructions we tried rotating encoder wiring, then tried moving encoder ring. Each time we had no motor movement, and several encoder faults. We discussed problem with customer and stated that the encoders were out of position and alignment. Monday we will duplicate the positions of an existing encoder wheel in operation (Unit 2) as our starting point.	
Keep tack of hours	MRZ: 13hrs DJC: 13hrs.	

Signed: Mikhail Zakin, Denny Ciramella

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ENGINEER'S DAILY SITE LOG

No:IPP/16_Apr_07
Day: Monday
Date: 16 April 07

Contract NGD70116Contract: Intermountain Power Projects – ID Fans Upgrade
Work Area: Unit 1 Shutdown – ID Fan commissioning

WORK AREA	DESCRIPTION OF WORK CARRIED OUT/ PROBLEMS	Time
Site safety	o Morning safety briefing for commissioning crew conducted by M.Z.	
6900 V clearance	o Continued to work under the 6.9 kV clearance for the ID Fan A.	
Encoder setting and Motor cabling problems	o Work in Drive 1-A1. o Set alignment of encoder prox switches and ring. While testing noticed we were getting irregular patterns and found broken wire in junction box for prox switches. Upon further checking found the crimping was improper and had several wires broken off. Had IPP electricians under our supervision recrimp all prox switch connections. During standard encoder testing we rotated encoder signals through all 6 patterns and observed current and voltage for exciter and stator but no motor rotation. Concluded that motor phasing was reversed, which we had mentioned to customer upon arriving at site and doing initial cable checking. At this point customer wanted to rotate encoder ring to try and start motor. We had a discussion and explained that the only possible conclusion for motor to not rotate during encoder test with all 6 patterns observed and exciter and stator getting current and voltage was motor phasing incorrect. Upon this explanation customer insisted that we rotate encoder ring and try running before he would allow clearance to be signed on to perform work on motor. At this point we agreed to rotate encoder ring again with no motor rotation resulting. Customer was satisfied and signed clearances for work to be performed. IPP originally was going to switch phases at motor, but after disconnecting phases found that cabling was not long enough to switch at motor. They reassembled cabling at motor and changed at output of motor disconnect in control room. At this point it was around 9:45 at night and we had to sign on clearances to start motor. We attempted one encoder pattern to start motor, and motor did not rotate. We will continue testing tomorrow.	
Keep tack of hours	MRZ: 15hrs DJC: 15hrs	

Signed: Mikhail Zakin, Denny Ciramella

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ENGINEER'S DAILY SITE LOG

No:IPP/17_Apr_07
Day: Tuesday
Date: 17 April 07

Contract NGD70116Contract: Intermountain Power Projects – ID Fans Upgrade
Work Area: Unit 1 Shutdown – ID Fan commissioning

WORK AREA	DESCRIPTION OF WORK CARRIED OUT/ PROBLEMS	Time
Site safety	o Morning safety briefing for commissioning crew conducted by M.Z.	
6900 V clearance	o Continued to work under the 6.9 kV clearance for the ID Fan A.	
Encoder setting and Motor cabling problems	o Work in Drive 1-A1. o Continued working on setting encoder. Started and found an intermittent loses of signal tripping drive on encoder fault. We established that Prox switch 1a (A32.3 on TB3/25 phase AB) Prox switch 2a (A32.1 on TB3/23 phase BC) and Prox switch 3a (A32.2 on TB3/24 phase CA) gave us a clockwise rotation of motor (confirming yesterdays results that motor phasing was incorrect). Found original field wiring at TB3/23-25 landed by IPP was incorrect. We had several delays throughout the day trying to test, because IPP was conducting generator tests and power for our testing was unavailable. This limited our ability to troubleshoot encoder problem. We have pin pointed the problem to exist within the prox switch wiring and encoder wheel. The wheel is not concentric with the motor shaft and the gapping will need to be set and positioning of wheel adjusted. Tomorrows testing will conclude weather we can rectify problem with the offset wheel or need to have IPP align a properly centered wheel on motor shaft.	
Type C PIB	o During the testing we had a Current feedback failure in 1-A1, and had to replace the type 'C' PIB with the one in 1-B2 because no spares were available. Failed board will be shipped back to Pittsburgh in the am.	
Spang	o Finished calibration of the Spang exciter in 1-B2 drive.	
Keep tack of hours	MRZ: 12hrs DJC: 12hrs	

Signed: Mikhail Zakin, Denny Ciramella

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ENGINEER'S DAILY SITE LOG

No:IPP/18_Apr_07
Day: Wednesday
Date: 18 April 07

Contract NGD70116Contract: Intermountain Power Projects – ID Fans Upgrade
Work Area: Unit 1 Shutdown – ID Fan commissioning

WORK AREA	DESCRIPTION OF WORK CARRIED OUT/ PROBLEMS	Time
Site safety	o Morning safety briefing for commissioning crew conducted by M.Z.	
6900 V clearance	o Continued to work under the 6.9 kV clearance for the ID Fan A.	
Encoder setting and Motor cabling problems	o Work in Drive 1-A1. o Started to align the prox switch gap setting on encoder wheel to compensate for the non-concentric alignment of wheel to motor shaft. At each rotation of the wheel new alignments had to be made. On several start attempts when motor rotation was achieved the lobe would hit a prox switch and switch had to be replaced. After two switches were damaged and no spares available, we had to rewire the 1B-2B-3B prox switches to use as the A prox switches. At this time customer wanted to change customer I/O board, so we changed out I/O board. After systematically rotating wheel and adjusting prox switch gaps we were finally able to achieve rotation of motor with drive 1-A1. This occurred around 22:00, we will continue tomorrow. Customer ordered new prox switches to arrive in am. We had various unexpected delays in aligning with wiring issues, cabling, wheel alignment, all which were reported to be done and tested by customer before arriving at site.	
Type C PIB	o Installed customer type"C" board that was not listed into 1B2 until we receive board from Pittsburgh.	
Spang	o Finished calibration of the Spang exciter in 1-B2 drive.	
Keep tack of hours	MRZ:16hrs DJC: 16hrs	

Signed: Mikhail Zakin, Denny Ciramella

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ENGINEER'S DAILY SITE LOG

No:IPP/19_Apr_07
Day: Thursday
Date: 19 April 07

Contract NGD70116Contract: Intermountain Power Projects – ID Fans Upgrade
Work Area: Unit 1 Shutdown – ID Fan commissioning

WORK AREA	DESCRIPTION OF WORK CARRIED OUT/ PROBLEMS	Time
Site safety	o Morning safety briefing for commissioning crew conducted by M.Z.	
6900 V clearance	o Continued to work under the 6.9 kV clearance for the ID Fan A.	
Encoder setting and Motor cabling problems	o Work in Drive 1-A1, 1-A2 o Continued systematically to align encoder prox switches and wheel while monitoring with scope phases Vbc and A32.1. On 1-A1 we had alignment but on channel A2 no rotation. Conclusion – encoder wheel still out of alignment 90 degrees. We will continue the process tomorrow. We did request to uncouple the motor to make alignment easier, but customer requested we continue to try with motor coupled. We also spoke to John Bradley who confirmed our approach on aligning encoder. The extra time involved in aligning encoders has come from inability to uncouple motor and customer original set up. Also according to the customers schedule encoder alignment and testing is thought April 20 with no load testing scheduled 21st and 22nd . Load testing to start on Monday the 23rd.	
Keep tack of hours	MRZ: 15hrs DJC: 15hrs	

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ENGINEER'S DAILY SITE LOG

No:IPP/20_Apr_07
Day: Friday
Date: 20 April 07

Contract NGD70116Contract: Intermountain Power Projects – ID Fans Upgrade
Work Area: Unit 1 Shutdown – ID Fan commissioning

WORK AREA	DESCRIPTION OF WORK CARRIED OUT/ PROBLEMS	Time
Site safety	o Morning safety briefing for commissioning crew conducted by M.Z.	
6900 V clearance	o Continued to work under the 6.9 kV clearance for the ID Fan A.	
Encoder setting and Motor cabling problems	o Work in Drive 1-A1, 1-A2, 1-B1, and 1-B2 o Discussed motor cabling with customer and decision was made to rotate encoder rings, rather than switch phases in the other three drives. We started with 1-A2 and had some stability in mode 1, but were unable to go to mode 2. At this point customer decided to change phases in 1-A1 motor output, and we would proceed to 1-B1 and 1-B2. o Clearances were signed off and grounds were put on A drive. o Clearances were signed on to proceed with work on B channels. o We proceeded with channel 1-B1 but moved to channel 1-B2; IPP had DCS issues with closing breaker. o Channel 1-B2 was started and encoder was rotated to get stable speed in mode 1 with stator voltage feedback normal and speed control obtained. We then proceeded to mode 2. And were able to run drive to only 45% speed no load. This was max speed permitted by customer with dampers closed. Saved waveforms for Encoders and stator voltage. o IPP corrected breaker issues with 1-B1 and we were able to run drive with same results as 1-B2. o Ran both channels (12 pulse mode) up to 40% speed. All systems were normal. o Electricians finished cabling changes for 1-A1, and we signed off and on clearances again to work on 1-A1 and A2. o Again IPP had breaker closure issues and we were delayed 1 hour. o We attempted to run 1-A1 and motor started in reverse rotation with no speed control. o Rotated encoder ring to get a forward rotation start and scoped encoder feedbacks and aligned with stator voltage.. o We were able to run mode 1 with speed control and good stator voltage feedback. WE proceeded to mode 2 with a smooth speed transition and maintained speed control up to 150 rpm (max speed per customer request) o Proceeded to 1-A1 and started in mode 1 , but stator voltage feedback was unstable and were unable to go to mode 2. We made prox switch alignments on encoder ring and will continue tomorrow to check settings.	
Gating PSU	o During operation of 1-B1 with speed at 30% we had a trip on gating PSU. (GDS1194-6002). Checked circuit with no apparent problems found. Reset gate supply breaker and drive. Started and ran to 45 % speed for 30 minutes. All systems normal.	
Delays	o 5 hours total delays 3 for clearances and motor rewire and 2 for DCS breaker issues.	
Keep Track of Time	MRZ: 15 DJC: 15	

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ENGINEER'S DAILY SITE LOG

No:IPP/21_Apr_07
Day: Saturday
Date: 21 April 07

Contract NGD70116Contract: Intermountain Power Projects – ID Fans Upgrade
Work Area: Unit 1 Shutdown – ID Fan commissioning

WORK AREA	DESCRIPTION OF WORK CARRIED OUT/ PROBLEMS	Time
Site safety	o Morning safety briefing for commissioning crew conducted by M.Z.	
6900 V clearance	o Opened 6.9 kV clearance for the ID Fan A. and B	
Encoder setting and Stator Voltage feedback	o Work in Drives 1-A1, 1-A2 o Continued adjusting encoders and found we had unreliable stator feedback. That would not let the drive to go to mode 2. Started to check for possible problems with any of the components or wiring in feedback circuit. Replaced type "C" board, Sigma core board, ribbon cables, resistor board, and stator voltage feedback transformer (PT 1 and 2), each component separately from 1-B2 drive which had been tested and running, and traced out all wiring for circuit and found no problems. All with no change in stator voltage feedback. We can conclude that the components for the stator voltage feedback circuit in the drive are all normal. Tomorrow we will rework the encoder wheel again to insure that it is properly set up.	
1B1 and 1B2 drives	o Ran Channels 1 and 2 B for 30 minutes at 450 rpm, as per customer instructions. Motor vibration was checked. Also performed chop over test several times with no problems. We stopped drives. Before leaving site we were requested to run Fan B channels 1 and 2 drives again. At start while breaker was closed aux contact of breaker for B2 opened and drives tripped on sync supply lose, but breaker continued to stay closed. Control room stated there was a problem with DCS controls and they would try and rectify it as soon as possible.	
Delays	o Clearances 2 hours DCS breaker problem 1 hour.	
Keep Track of Time	MRZ: 15hrs DJC: 15hrs	

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ENGINEER'S DAILY SITE LOG

No:IPP/22_Apr_07
Day: Sunday
Date: 22 April 07

Contract NGD70116Contract: Intermountain Power Projects – ID Fans Upgrade
Work Area: Unit 1 Shutdown – ID Fan commissioning

WORK AREA	DESCRIPTION OF WORK CARRIED OUT/ PROBLEMS	Time
Site safety	o Morning safety briefing for commissioning crew conducted by M.Z.	
6900 V clearance	o Opened 6.9 kV clearance for the ID Fan A. and B	
Drive 1A1 and 1A2 **Encoder setting and Stator Voltage feedback**	o Work in Drive 1-A1, 1-A2 o After positioning encoder wheel all 360 degrees, it made no difference in stator voltage feedback. We tried adjusting phase-offset angle for machine alpha also with no change. Being that problem existed with both A channel drives we concluded problem could be with motor. We started checking circuits for motor and exciter. We observed that some components on A motor exciter had different readings. We stopped B channel fans again to take readings for comparison. We also had IPP get prints for exciter. After examine prints and taking readings on B channel fans we compared to A channel fans and found considerable differences. IPP stated they would get spare parts and investigate first thing in the am.	
1B1 and 1B2 drives	o Before starting B channel fans we checked power components and found 1 faulty SCR in supply bridge arm 6 of drive 1-B2. We will replace module before full load run on Tuesday. o Left B drive running at 300 rpm in 12 pulse mode overnight.	
Delays	o Clearances 2 hours.	
Keep Track of Time	MRZ: 15hrs DJC: 15hrs	

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ENGINEER'S DAILY SITE LOG

No:IPP/23_Apr_07
Day: Sunday
Date: 23 April 07

Contract NGD70116Contract: Intermountain Power Projects – ID Fans Upgrade
Work Area: Unit 1 Shutdown – ID Fan commissioning

WORK AREA	DESCRIPTION OF WORK CARRIED OUT/ PROBLEMS	Time
Site safety	o Morning safety briefing for commissioning crew conducted by M.Z.	
6900 V clearance	o Opened 6.9 kV clearance for the ID Fan A. and B	
Drive 1A1 and 1A2 **Stator Voltage feedback**	o Work in Drive 1-A1, 1-A2 o Continued to check stator voltage feedback issue. Both drives will run in mode 1 and with mode 2 inhibited (inhibit synchronize) we ramped drives to 15% speed and observed stator voltage feedback very unstable and bouncing from 0 to 16%. We again discussed issue with John Bradley and we were advised to scope signals from bus bar to type "C" board termination points. In both A1 and A2 drives scoped waveforms were the same, and appeared stable. Being the problem with the feedback exists in both drives are we going to try and get clearance to conduct a test to pinpoint either a drive problem or exciter/motor problem? We are proposing to run A drive and take stator voltage feedback into B drive which is know to work and monitor feedback signal.	
1B1 and 1B2 drives	o Drive B both channels ran over night at 300 rpm with closed dampers. All systems were normal. We completed all no load testing on B drives: Stator voltage feedback and alignment test, Exciter phase rotation test, Speed regulator checks, V/F control checks, Stop/start tests, Operational stability tests, E-stop test, Master/slave control transfer test, Ground fault relay test. Operations has not performed their remote mode tests, also we were unable to perform load test because customer work is still not completed. At this date no time frame has been given when work will be completed and load test can be performed.	
Delays	o Clearances 2 hours.	
Keep Track of Time	MRZ: 15hrs DJC: 15hrs	

Signed: Mikhail Zakin, Denny Ciramella

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ENGINEER'S DAILY SITE LOG

No:IPP/24_Apr_07
Day: Monday
Date: 24 April 07

Contract NGD70116Contract: Intermountain Power Projects – ID Fans Upgrade
Work Area: Unit 1 Shutdown – ID Fan commissioning

WORK AREA	DESCRIPTION OF WORK CARRIED OUT/ PROBLEMS	Time
Site safety	o Morning safety briefing for commissioning crew conducted by M.Z.	
6900 V clearance	o Opened 6.9 kV clearance for the ID Fan A. and B	
Drive 1A1 and 1A2 **Stator Voltage feedback**	o Work in Drive 1-A1, 1-A2 o Set up test to determine if unstable stator voltage feedback is coming from exciter or drive issue. We connected cables from 1-A1 motor to 1-B1 drive line side of disconnect to bus. We started 1-A2 and observed feedback in drive 1-B1. Results showed that feedback in 1-A2 was very unstable while feedback signal in 1-B1 was stable. Conclusion is stator and rotor are in working order and stator voltage feedback problem is limited to drive. We repeated test for 1-A1 and found that stator voltage feedback is stable, but prior to testing had been unstable. We switched sigma units between 1-A1 and 1-A2. The feedback problem moved to 1-A1 and 1-A2 feedback signal was stable. We traced problem to faulty sigma core board in 1-A2. Conclusion when we originally replaced it with customer spare core board, board was also faulty. Customer let us take Sigma unit from drive 1-C2 (upgraded 2 years ago). We now have Sigma unit from 1-C2 channel running 1-A1. We will need to replace Sigma unit by this Thursday April 26. o At customer request fan drives 1-A1 and 1-A2 were run over night at 200 rpm.	
1B1 and 1B2 drives	o Installed one SCR module in Supply Bridge to replace the module that had one faulty SCR. o Tested water flow and repeated pulse test.	
Heat run	o Originally scheduled for Monday was delayed due to continued work in boiler. Customer has rescheduled testing for Friday or Saturday evening April 28-29.	
Delays	o Clearances 1 hour.	
Keep Track of Time	MRZ: 14hrs DJC: 14hrs	

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ENGINEER'S DAILY SITE LOG

No:IPP/25_Apr_07
Day: Thursday
Date: 25 April 07

Contract NGD70116Contract: Intermountain Power Projects – ID Fans Upgrade
Work Area: Unit 1 Shutdown – ID Fan commissioning

WORK AREA	DESCRIPTION OF WORK CARRIED OUT/ PROBLEMS	Time
Site safety	o Morning safety briefing for commissioning crew conducted by M.Z.	
6900 V clearance	o Continued to work under clearance for the ID Fan A.	
Drive 1A1 and 1A2	o Work in Drive 1-A1, 1-A2 o Let 1A1 and 1A2 run overnight at 200 rpm all systems normal. o Performed all no load test for A fan channels 1 and 2: Exciter phase rotation check, Speed regulator control checks, V/F control checks (700 rpm), Remote mode test, Stop/start test, Operational and stability tests, Beta and recovery time checks (700 rpm), Drive operation check, E-stop check, Master/slave switch over test, Ground fault relay test, (during test for 1A1 found that motor cables were not grounded properly-IPP corrected). All tests were documented in commissioning instructions and waveforms were stored in .wav format on M.Z. laptop.	
1B1 and 1B2 drives	o IPP has been using 1B1 and 1B2 drives for drafting air for work in boiler, all systems performing normally.	
Heat run	o Originally scheduled for Monday was delayed due to continued work in boiler. Customer has rescheduled testing for Friday or Saturday evening April 28-29.	
Delays	o Install 1A1 motor cables grounding 1 hour, Covers for exciter motors 1 hour.	
Keep Track of Time	MRZ: 12hrs DJC: 12hrs	

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ENGINEER'S DAILY SITE LOG

No:IPP/26_Apr_07
Day: Thursday
Date: 26 April 07

Contract GD70116Contract: Intermountain Power Projects – ID Fans Upgrade
Work Area: Unit 1 Shutdown – ID Fan commissioning

WORK AREA	DESCRIPTION OF WORK CARRIED OUT/ PROBLEMS	Time
Site safety	o Morning safety briefing for commissioning crew conducted by M.Z.	
6900 V clearance	o Continued to work under clearance for the ID Fan A.	
Drive 1A1 and 1A2	o Work in Drive 1-A1, 1-A2 o Let 1A1 and 1A2 run overnight at 200 rpm all systems normal. o Ran both drives up and down speed. All systems performing normally. o Removed all pigtails and jumpers used for tests. o Closed all wire ways.	
1B1 and 1B2 drives	o IPP has been using 1B1 and 1B2 drives for drafting air for work in boiler, all systems performing normally.	
Sigma core boards.	o Received two Sigma core boards from Pittsburgh.	
1C2 drive.	o Mounted Sigma core board in Sigma assembly. o Installed Sigma assembly in the drive 1C2. o We were not able to test the drive 1C2 due to the maintenance clearance on it.	
Heat run.	o Customer has scheduled testing for Friday night April 27	
Finalizing the drives	o Download the program in each drives and replaced the batteries in each Sigma.	
Keep track of time	MRZ: 12hrs DJC: 12hrs	

Signed: Mikhail Zakin, Denny Ciramella

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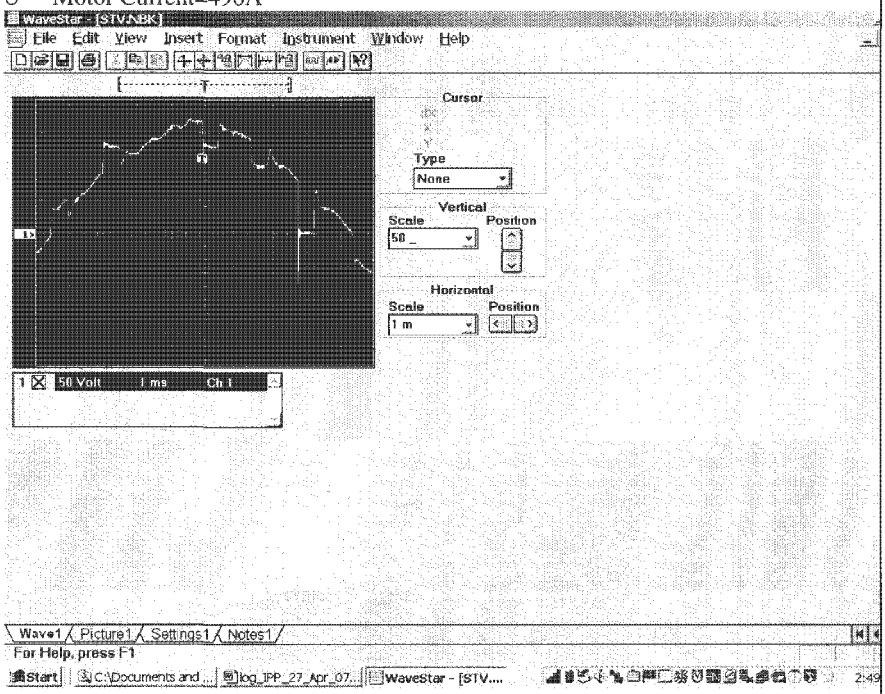
ENGINEER'S DAILY SITE LOG

No: IPP/27_April_07
Day: Friday
Date: 27_April_07

Work Area: Unit 1 Shutdown – ID Fan commissioning
Contract No: GD701176: ID fans upgrade.

WORK AREA	DESCRIPTION OF WORK CARRIED OUT/ PROBLEMS	Time
Site safety	o Safety briefing for commissioning crew conducted by M.Z.	
6900 V clearance	o Continued to work under clearance for ID Fan A. o Opened clearance for ID Fan B.	
Heat run **Drive 1A1 and 1A2**	o Came to run Heat test starting at 1 am o Ran Fan A at Speed 856 RPM o Speed L2152=89.25% o Current reference L12601=73.48% o Supply Volts=4018V o Motor Volts=3870V o Motor Current=490A  o Monitored DC reactor T as per commissioning instruction.	

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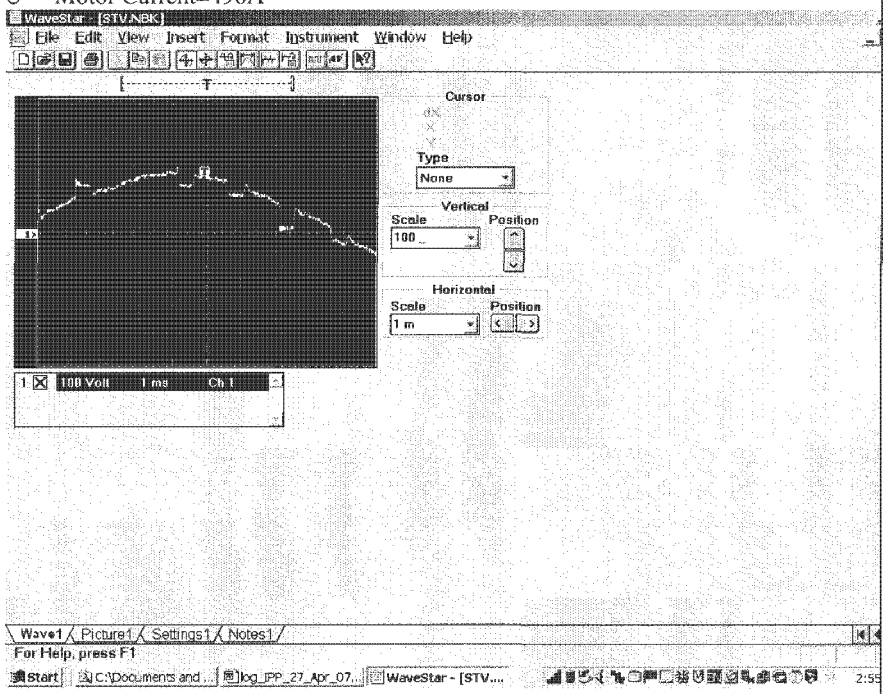
Heat run **1B1 and 1B2 drives**	○ Ran Fan B at Speed 827 RPM ○ Speed L2152=86.85% ○ Current reference L12601=73.48% ○ Supply Volts=4030 v ○ Motor Volts=3948V ○ Motor Current=496A  ○ Monitored DC reactor T as per commissioning instruction.	
1A1 DC reactor	○ DC reactor fan 1 alarm. ○ DC reactor fan1 air flow switch should be replaced.	
Heat run test result	○ Heat run test signed by customer as: "Test pass OK" for all four drives.	
Travel	○ Travel back to Pittsburgh.	
Keep track of time	MRZ: 17hrs DJC: 17 hrs	

Signed: Mikhail Zakin, Denny Ciramella

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Dual Channel Synchdrive Commissioning Schedule

	REF	TEST	PRE-CONDITIONS	Hrs
LV CHECKS 120V/480V Supplies on 1 man/channel	1.	**Preparation**	All test equipment on site	8
	2.	General equipment check	All Drives/auxiliaries on site & erected	4
	3.	Interconnections		4
	4.	Preliminary check with power off	All cabling complete & contractors off drive	4
	5.	Low voltage supply check	All auxiliary supplies available i.e. 480V, 120V phase reference	4
	6.	Cooling system fill & check	Customer provided de-ionised water on site and available	8
	7.	Power up regulator / gating power supply		2
	8.	Download software	Program complete and tested in factory	1
	9.	Digital I/O relay logic check		16
	10.	Analog I/O check		8
	11.	Exciter Reference Checks		6
	12.	Diagnostic serial link check		1
	13.	Hardware over current check		2
	14.	Supply breaker interlocks		2
	15.	Firing pulse check		8
	16.	Encoder Switching sequence Tests	Manual rotation of motor available. This may include all motor bearing lubrication to be commissioned. If encoder setup is completed prior to this then not necessary.	8
HV Checks Main Power on 1 man/channel	17.	Emergency Stop Tests to verify HV breaker will trip for E-Stop		2
	18.	Phasing checks	Main HV power available	4
	19.	DC link open circuit tests		4
	20.	Open Loop Short Circuit Tests	Shorting link to be fitted	4
	21.	Closed Loop Short Circuit Tests		2
	22.	Single channel uncoupled safety inspection		4
	23.	Main ACCB fast phase back timing check	Customer responsibility to be verified by Alstom	2
	24.	Emergency Stop Tests to verify HV breaker will trip for E-Stop		2
Motor rotational checks All power supplies on Freedom to run motor as needed	25.	Mode 1 checks	Motor made safe & ready to run	4
	26.	Stator volts feedback phasing and encoder alignment check		4
	27.	Speed regulator control check		4
	28.	Single channel load test-preliminary checks	Motor must be coupled. This may introduce a few hours time delay.	4
	29.	V/f control checks		4
	30.	Single channel load tests Remote mode		4
	31.	Dual channel no load operational & stability checks		4
	32.	Stop/Start Tests		2
	33.	Dual channel Full Load Current Checks	Entire Boiler available including all auxilliaries needed to draw 100% speed & load.	8
	34.	Chop over Checks		8
	35.	Final Procedures & wrap-up		8
	36.	Complete harmonic measurements		8
	37.	Hose re-torque		4
			TOTAL HOURS	176

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Date: 4/3/2006 5:28:05 PM
Subject: IPP Daily Logs 01 april & 03 april 2006

"log_IPP_jbd_01_Apr_06.doc"
"log_IPP_jbd_03_Apr_06.doc"

:._____

CC: <nathan-c@ipsc.com>

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ENGINEER'S DAILY SITE LOG

No: JBD/IPP/01_Apr_06
Day: Saturday
Date: 01 April 06
Contract No: GD70116

Contract: Intermountain Power Projects – ID Fans Upgrade

Work Area: Unit 2 Shutdown – Emergency Call-Out for Unit 2 'D' Fan

WORK AREA	DESCRIPTION OF WORK CARRIED OUT/ PROBLEMS	Time
Call out	Customer requires Fan 'D' to be run in local control for outage. Customer required assistance from me to achieve this goal. Discoveries: - Up/Down arrows for local (HMI) speed reference are not functional. - While running both channels in local mode, the customer tripped the 6.9 KV breaker to the Master and the Slave did not automatically become the Master and the drive tripped.	
Keep track of hours	JBD: 4 hrs.	

WORK AREA	Description of next activities

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ENGINEER'S DAILY SITE LOG

No: JBD/IPP/03_Apr_06
Day: Monday
Date: 03 April 06
Contract No: GD70116

Contract: Intermountain Power Projects – ID Fans Upgrade

Work Area: Unit 2 Shutdown – ID Fan Commissioning

WORK AREA	DESCRIPTION OF WORK CARRIED OUT/ PROBLEMS	Time
IPP Safety Induction	- Safety Induction: Mikhail Zakin & Barry Daugherty	
Site Status	- Wiring still in progress, no major problem to report.	
Site Prep	- Setup working area, storage area for tools and test equipment. - Setup latest Sigma Program from Sid Pant on Mikhail Zakin & Barry Daugherty's commissioning laptops.	
Motor cables	- Proved cables between drive, disconnect switch, and motor by disconnecting cables at motors and checking continuity with ohm-meter by shorting each cable to ground. - Updated Site-Master drawing as required. - Cables are connected as follows: For clockwise rotation drives (Fan A & Fan B) Channel 1: Drive End — Cable — Motor End (terminal box or "Peckerhead") T1----------(Brown 'A')----------→T1 '1' (left when looking into motor) T2----------(Orange 'B')----------→T2 '2' (center when looking into motor) T3----------(Yellow 'C')----------→T3 '3' (right when looking into motor) Channel 2: Drive End — Cable — Motor End (terminal box or "Peckerhead") T1----------(Brown 'A')----------→T7 '1' (left when looking into motor) T2----------(Orange 'B')----------→T8 '2' (center when looking into motor) T3----------(Yellow 'C')----------→T9 '3' (right when looking into motor) For counter-clockwise rotation drives (Fan C) Channel 1: Drive End — Cable — Motor End (terminal box or "Peckerhead") T1----------(Brown 'A')----------→T1 '1' (left when looking into motor) T2----------(Orange 'B')----------→T3 '3' (right when looking into motor) T3----------(Yellow 'C')----------→T2 '2' (center when looking into motor) Channel 2: Drive End — Cable — Motor End (terminal box or "Peckerhead") T1----------(Brown 'A')----------→T7 '1' (left when looking into motor) T2----------(Orange 'B')----------→T9 '3' (right when looking into motor) T3----------(Yellow 'C')----------→T8 '2' (center when looking into motor)	
Keep track of hours	JBD: 10 hrs MZ: 10 hrs	

WORK AREA	Description of next activities

Signed: J. Barry Daugherty **Name:** J. Barry Daugherty / Mikhail Zakin

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ENGINEER'S DAILY SITE LOG

No: JBD/IPP/04_Apr_06
Day: Tuesday
Date: 04 April 06
Contract No: GD70116

Contract: Intermountain Power Projects – ID Fans Upgrade

Work Area: Unit 2 Shutdown – ID Fan Commissioning

WORK AREA	DESCRIPTION OF WORK CARRIED OUT/ PROBLEMS	Time
Field wiring terminations	- 98% complete by electrical contractor - IPP to check some wiring problems.	
Encoder wiring	- To be completed by tomorrow end by IPP technicians.	
Motor cable re-termination	- To be completed by tomorrow end by IPP.	
Drive cubicle shipping split connections	- Electrical connections 90% complete by Converteam Engineers – to be completed tomorrow. - Water Cooling connections (plumbing) 50% complete. Also require three 'O' rings (missing): one 1" O.D., two 2" O.D..	
Drawing mark-ups	- Updated site working copies to accurately depict Motor cable connections.	
Keep track of hours	JBD: 12 hrs MZ: 12 hrs	

WORK AREA	Description of next activities

Signed: _____ **Name:** J. Barry Daugherty / Mikhail Zakin

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ENGINEER'S DAILY SITE LOG

No: JBD/IPP/05_Apr_06
Day: Wednesday
Date: 05 April 06
Contract No: GD70116

Contract: Intermountain Power Projects – ID Fans Upgrade

Work Area: Unit 2 Shutdown – ID Fan Commissioning

WORK AREA	DESCRIPTION OF WORK CARRIED OUT/ PROBLEMS	TASK CODES
	Brian Wootton arrived on site today and received safety induction and site introduction.	
Shipping Split Connections	- Completed water cooling connections (O-rings purchased locally) - Completed all shipping split electrical connections & fiber optic connections.	
Field wiring	- Completed.	
Fan A	- Clearance to power up auxiliary supplies achieved. - Powered up 120 VAC control power and light/receptacle power. - Power=up checks started.	
Keep Track of Hours	- JBD: 12 hrs - MK: 12 hrs	

DELAYS	TIME

WORK AREA	DESCRIPTION OF NEXT ACTIVITIES
	Expect to gain clearance to start powering-up Fan B and Fan C tomorrow.

Signed: J. Barry Daugherty **Name:** J. Barry Daugherty / Mikhail Zakin

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CONVERTEAM
THE POWER CONVERSION COMPANY

ENGINEER'S DAILY SITE LOG

No: JBD/IPP/06_Apr_06
Day: Thursday
Date: 06 April 06
Contract No: GD70116

Contract: Intermountain Power Projects – ID Fans Upgrade

Work Area: Unit 2 Shutdown – ID Fan Commissioning

WORK AREA	DESCRIPTION OF WORK CARRIED OUT/ PROBLEMS	TASK CODES
Fan A	- Latest Sigma program downloaded. - Latest HMI program downloaded. - Cooling water system commissioned. Secondary water cooling not connected yet. - All auxiliary power supplies checked. - Control circuits checked. - Internal I/O checked. - Fixed problems with door switches not being actuated when doors closed. - Fixed problem with door not closing properly (cause of broken handles) – had to loosen and push in an SCR module as the door latch was hitting against it.	
Fan B	- Latest Sigma program downloaded. - Latest HMI program downloaded. - Cooling water system commissioned. Secondary water cooling not connected yet. - All auxiliary power supplies checked. - Ready for I/O checks.	
Fan C	- Latest Sigma program downloaded. - Latest HMI program downloaded. - Cooling water system commissioned. Secondary water cooling not connected yet. - All auxiliary power supplies checked. - Ready for I/O checks. - Need replacement GD1194-6002 Gating PSU. One spare on site, will need replaced.	
Other	- Spare set of control cabinet fuses required on site.	
Keep Track of Hours	- JBD: 13.5 hrs - MK: 13.5 hrs - BW: 13.5 hrs	

DELAYS	TIME

WORK AREA	DESCRIPTION OF NEXT ACTIVITIES

Signed: J. Barry Daugherty **Name:** J. Barry Daugherty / Mikhail Zakin

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ENGINEER'S DAILY SITE LOG

No: JBD/IPP/06_Apr_07
Day: Friday
Date: 07 April 06
Contract No: GD70116

Contract: Intermountain Power Projects – ID Fans Upgrade

Work Area: Unit 2 Shutdown – ID Fan Commissioning

WORK AREA	DESCRIPTION OF WORK CARRIED OUT/ PROBLEMS	TASK CODES
I/O Checks	- 95% complete	
Digital I/O to IPP Modicon controller	- All Drives. - All digital I/O proven. - Found and corrected wiring problems.	
Analog I/O to IPP Coordinated Control Systems (CCS).	- All drives. - New control system is not yet installed. - I/O checked up to the CCS control cabinets. - Proved Sigma scaling and isolator calibrations. - Found and corrected several wiring problems.	
Water Cooling Checks	- All drives. - Flow checked and adjusted: o Surge Circuits: > or = 1 GPM o SCR Modules: > or = 1.5 GPM	
Rotor Position Sensors	- All Drives. - Installed and gap-adjusted. - Function checked to Sigma inputs.	
Door switch interlocks	- All Drives' door switch interlock adjusted.	
Door latching	- Mechanical adjustments made as required to allow cabinet doors to open and close. Believe this was required due to slight movements of hardware during shipment.	
1D1 Gating PSU	- Suspect damage during shipment. - Replaced with spare. - Tested: OK	
Keep Track of Hours	- JBD: 13 hrs - MK: 13 hrs - BW: 13 hrs	

DELAYS	TIME

WORK AREA	DESCRIPTION OF NEXT ACTIVITIES

Signed: J. Barry Daugherty **Name:** J. Barry Daugherty / Mikhail Zakin

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ENGINEER'S DAILY SITE LOG

No: JBD/IPP/06_Apr_07
Day: Friday
Date: 07 April 06
Contract No: GD70116

Contract: Intermountain Power Projects – ID Fans Upgrade

Work Area: Unit 2 Shutdown – ID Fan Commissioning

WORK AREA	DESCRIPTION OF WORK CARRIED OUT/ PROBLEMS	TASK CODES
I/O Checks	- 95% complete	
Digital I/O to IPP Modicon controller	- All Drives. - All digital I/O proven. - Found and corrected wiring problems.	
Analog I/O to IPP Coordinated Control Systems (CCS).	- All drives. - New control system is not yet installed. - I/O checked up to the CCS control cabinets. - Proved Sigma scaling and isolator calibrations. - Found and corrected several wiring problems.	
Water Cooling Checks	- All drives. - Flow checked and adjusted: o Surge Circuits: > or = 1 GPM o SCR Modules: > or = 1.5 GPM	
Rotor Position Sensors	- All Drives. - Installed and gap-adjusted. - Function checked to Sigma inputs.	
Door switch interlocks	- All Drives' door switch interlock adjusted.	
Door latching	- Mechanical adjustments made as required to allow cabinet doors to open and close. Believe this was required due to slight movements of hardware during shipment.	
1D1 Gating PSU	- Suspect damage during shipment. - Replaced with spare. - Tested: OK	
Keep Track of Hours	- JBD: 13 hrs - MK: 13 hrs - BW: 13 hrs	

DELAYS	TIME

WORK AREA	DESCRIPTION OF NEXT ACTIVITIES

Signed: J. Barry Daugherty **Name:** J. Barry Daugherty / Mikhail Zakin

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ENGINEER'S DAILY SITE LOG

No: JBD/IPP/08_Apr_06
Day: Saturday
Date: 08 April 06
Contract No: GD70116

Contract: Intermountain Power Projects – ID Fans Upgrade

Work Area: Unit 2 Shutdown – ID Fan Commissioning

WORK AREA	DESCRIPTION OF WORK CARRIED OUT/ PROBLEMS	TASK CODES
I/O Checks	- Complete on all drives	
Pulse Checks	- Complete on all drives	
Hardware O/C checks	- Complete on all drives	
Diagnostics System checks	- Complete on all drives - Checked jumpers and DIP switches on Pulse Distribution cards - Will simulate overtemperature fault after preliminary rotation	
Exciter Reference Checks & Calibration	- Complete on all drives - Updated Commissioning Instructions document for clarity	
Prep for testing with main supplies on	- Converteam site team signed-on for clearance for closing all 6.9 kV breaker for drive commissioning. - Set-up Voltage Divider resistor boxes and test equipment for Medium Voltage testing tomorrow.	
Keep Track of Hours	- JBD: 12 hrs - MK: 12 hrs - BW: 12 hrs	

DELAYS	TIME

WORK AREA	DESCRIPTION OF NEXT ACTIVITIES

Signed: J. Barry Daugherty **Name:** J. Barry Daugherty / Mikhail Zakin

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ENGINEER'S DAILY SITE LOG

No: JBD/IPP/09_Apr_06
Day: Sunday
Date: 09 April 06
Contract No: GD70116

Contract: Intermountain Power Projects – ID Fans Upgrade

Work Area: Unit 2 Shutdown – ID Fan Commissioning

WORK AREA	DESCRIPTION OF WORK CARRIED OUT/ PROBLEMS	TASK CODES
Supply Breaker Interlocks	- Checked for all drives: OK	
ACCB Fast Phaseback	- Checked for all drives: OK (30 to 40 ms)	
Phasing Checks	- Checked for all drives: OK o Phase sequence OK o Synchronizing supply offset OK o AC Input voltage indication correct	
DC Link Open Circuit Checks	- Checked for all drives: OK	
Short Circuit Tests	- Started on Fan A.	
Preliminary Rotation	- Voltage dividers connected to stator cables for Fan A. - Expecting to start tests tomorrow on Fan A.	
	-	
Keep Track of Hours	- JBD: 12 hrs - MK: 12 hrs - BW: 12 hrs	

DELAYS	TIME

WORK AREA	DESCRIPTION OF NEXT ACTIVITIES

Signed: J. Barry Daugherty **Name:** J. Barry Daugherty / Mikhail Zakin

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ENGINEER'S DAILY SITE LOG

No: JBD/IPP/10_Apr_06
Day: Monday
Date: 10 April 06
Contract No: GD70116

Contract: Intermountain Power Projects – ID Fans Upgrade

Work Area: Unit 2 Shutdown – ID Fan Commissioning

WORK AREA	DESCRIPTION OF WORK CARRIED OUT/ PROBLEMS	TASK CODES
Short Circuit Tests	- Open-loop Short Circuit tests completed on all drives – current feedback proven, 6-pulse continuous current proven.	
Preliminary Rotation	- Completed on Fan A drives, Fan B & Fan C not available for turning due to lack of lubrication oil. - Proved direction of rotation. - Proved stator voltage phase sequence. - Checked rotor position indication sensors' alignment – needs fine adjustment (encoder ring is 22 degrees lagging stator voltage), but drive starts ok. Encoders must be rotated CCW ~5/8 of an inch for better alignment. - Checked Channel 1 stator voltage is leading Channel 2 stator voltage by 30 electrical degrees.	
Keep Track of Hours	- JBD: 12 hrs - MK: 12 hrs - BW: 12 hrs	

DELAYS	TIME

WORK AREA	DESCRIPTION OF NEXT ACTIVITIES

Signed: J. Barry Daugherty **Name:** J. Barry Daugherty / Mikhail Zakin

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ENGINEER'S DAILY SITE LOG

No: JBD/IPP/11_Apr_06
Day: Tuesday
Date: 11 April 06
Contract No: GD70116

Contract: Intermountain Power Projects – ID Fans Upgrade

Work Area: Unit 2 Shutdown – ID Fan Commissioning

WORK AREA	DESCRIPTION OF WORK CARRIED OUT/ PROBLEMS	TASK CODES
Output Disconnects	- All Output Disconnects tested	
Preliminary Rotation Tests	- Completed for all drives: o Stator voltage phasing tests for all drives. o Rotor position sensor alignment checks for all drives. o Drives ran upto 400 RPM.	
Dual Channel running	- All drives ran in dual channel mode. - Chop-over tested for all drives.	
Speed Control Stability checks	- Started on Fan B	
Exciter phase rotation checks	- Started on Fan B	
Other notes:	- Secondary cooling water problems closer to being solved. Drives ran ok unloaded without secondary cooling water (water cooling temperatures below alarm level). - Still running with limited power availability to Unit 2. Could affect load testing depending on when IPP will change supply to Unit 2.	
Keep Track of Hours	- JBD: 12 hrs - MK: 12 hrs - BW: 12 hrs	

DELAYS	TIME

WORK AREA	DESCRIPTION OF NEXT ACTIVITIES

Signed: J. Barry Daugherty **Name:** J. Barry Daugherty / Mikhail Zakin / Brian Wootton

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ENGINEER'S DAILY SITE LOG

No: JBD/IPP/12_Apr_06
Day: Wednesday
Date: 12 April 06
Contract No: GD70116

Contract: Intermountain Power Projects – ID Fans Upgrade

Work Area: Unit 2 Shutdown – ID Fan Commissioning

WORK AREA	DESCRIPTION OF WORK CARRIED OUT/ PROBLEMS	TASK CODES
Ground Fault Tests	- Completed successfully for all 6 drives. o Connected one inverter output phase leg to ground and measured at what speed the drive trips (ave: 20% of top speed)	
Exciter test mode	- Modified user program sot that the drive will trip when in Exciter Test Mode.	**001X**
Local Mode Min. Speed	- At customer's request, changed the minimum speed reference limit from 150 RPM to 0 RPM in Local Mode only. Tested OK.	
Conductivity trip problem	- Customer complained of existing drive's occasionally tripping from High Conductivity immediately after pump change-over (chop-over). o Changed conductivity alarm setpoint (starts deionization) from 0.600 uS/cm to 0.500 uS/cm o Changed the conductivity alarm hysteresis (stops deionization) from 0.400 uS/cm to 0.300 uS/cm o Added software to only permit the pumps to change-over while conductivity level is near the hysterisis level (between 0.350 and 0.340). Software was thoroughly tested and is working well. o Changed units used for Conductivity software to use uS/cm instead of raw input values – makes software much easier to understand and use.	**002X**
Other	- Secondary Cooling Water (customer cooling water) is not ready yet to apply to drives. Latest forecast is it will be ready tomorrow afternoon. - Answered questions from IPP techs regarding trouble-shooting and maintenance of the Synch Drives.	
	-	
Keep Track of Hours	- JBD: 12 hrs - MK: 12 hrs	

DELAYS	TIME

WORK AREA	DESCRIPTION OF NEXT ACTIVITIES

Signed: J. Barry Daugherty **Name:** J. Barry Daugherty / Mikhail Zakin

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ENGINEER'S DAILY SITE LOG

No: JBD/IPP/13_Apr_06
Day: Thursday
Date: 13 April 06
Contract No: GD70116

Contract: Intermountain Power Projects – ID Fans Upgrade

Work Area: Unit 2 Shutdown – ID Fan Commissioning

WORK AREA	DESCRIPTION OF WORK CARRIED OUT/ PROBLEMS	TASK CODES
Site Prep	- Cleaned up tools, test equipment, etc. General site organization. - Updated drawings and commissioning files.	
Meeting	- Discussed details of plan for load testing with customer. - Customer claims we will have as many hours as we need to complete testing on all fans on Sunday.	
Site Status	- Customer working on leaks in the secondary water cooling system.	
	-	
	-	
Keep Track of Hours	- JBD: 0 hrs - MK: 4 hrs	

DELAYS	TIME

WORK AREA	DESCRIPTION OF NEXT ACTIVITIES

Signed: J. Barry Daugherty **Name:** J. Barry Daugherty / Mikhail Zakin

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ENGINEER'S DAILY SITE LOG

No: JBD/IPP/14_Apr_06
Day: Friday
Date: 14 April 06
Contract No: GD70116

Contract: Intermountain Power Projects – ID Fans Upgrade

Work Area: Unit 2 Shutdown – ID Fan Commissioning

WORK AREA	DESCRIPTION OF WORK CARRIED OUT/ PROBLEMS	TASK CODES
HMI problem with speed referencing	- Attempted to correct problem with 'up' and 'down' arrows on HMI local control page. 'up' and 'down' arrows have no affect on speed reference. Cliff Watson consulted us via telephone, he will have to do further work on the problem.	
Water Cooling Pump Logic	- Made minor changes to the water cooling pump logic. Details were sent to Sid Pant. - Tested changes: OK.	
Exciter Output Phase Rotation Checks.	- Tests carried-out on Fan A, both channels. - Had to swap output phase leads on both channels as result of the test. - Discovered that Fan 'A' Channel 2 Exciter Output Voltage Feedback needed to be recalibrated. Recalibrated OK. - Fan 'B' and Fan 'C' to be tested tomorrow.	
Water Leaks	- Discovered water leaks in Fan B, both channels. - Leak was in shipping split. - Technicians stopped the leak by tightening the connections. - New 'O' rings may be required. - Problem is being monitored.	
Customer Cooling Water	- Still some problem's with the customer's secondary water cooling system. - At the moment we can have load on one fan at a time due to cooling restrictions. - System will be worked-on after load tests are complete.	
Temporary Supply	- Expect to have sufficient power available from the customer before Sunday for load tests.	
Keep Track of Hours	- JBD: 8 hrs - MK: 8 hrs	

DELAYS	TIME

WORK AREA	DESCRIPTION OF NEXT ACTIVITIES

Signed: J. Barry Daugherty **Name:** J. Barry Daugherty / Mikhail Zakin

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ENGINEER'S DAILY SITE LOG

No: JBD/IPP/15_Apr_06
Day: Saturday
Date: 15 April 06
Contract No: GD70116

Contract: Intermountain Power Projects – ID Fans Upgrade

Work Area: Unit 2 Shutdown – ID Fan Commissioning

WORK AREA	DESCRIPTION OF WORK CARRIED OUT/ PROBLEMS	TASK CODES
Exciter Output Phase Rotation Checks	- Complete for all three fans. - Results documented in each drive's Commissioning File.	
Spare Signal Isolator	- Were replaced with correct type in all drives drives.	
Analog outputs to IPP control system	- Current feedback signals verified. - Voltage feedback signals verified.	
Secondary Water Cooling	- Satisfactory, minor work to be done on Monday and Tuesday.	
Safety Sign-off	- Signed-off of A, B, and C fans with IPP to start load testing tomorrow.	
Temporary Supply	- Unit 2 is now powered by the Reserve Auxiliary Transformer (sufficient supply for load tests).	
Keep Track of Hours	- JBD: 8 hrs - MK: 8 hrs	

DELAYS	TIME

WORK AREA	DESCRIPTION OF NEXT ACTIVITIES

Signed: J. Barry Daugherty **Name:** J. Barry Daugherty / Mikhail Zakin

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ENGINEER'S DAILY SITE LOG

No: JBD/IPP/16_Apr_06
Day: Sunday
Date: 16 April 06
Contract No: GD70116

Contract: Intermountain Power Projects – ID Fans Upgrade

Work Area: Unit 2 Shutdown – ID Fan Commissioning

WORK AREA	DESCRIPTION OF WORK CARRIED OUT/ PROBLEMS	TASK CODES
Single-Channel Load Tests	- Able to get approximately 650 RPM at Current Limit for each channel. - V/F Checks Carried-out on all drives. o Trends captured for each drive.	

Dual-Channel Load Tests	- Able to get approximately 850 RPM at Current Limit for each Fan.
	- Field Exciter current and voltage monitored and recorded at various speeds up to 850 RPM.
	- Master/Slave Chop-over tested for each Fan at 850 RPM.
	- Stator Voltage waveform recorded for each channel.
	- Beta and Recovery Angle checked and recorded for each Channel.
	- Heat Runs carried-our for each drive.
	  o Each fan ran at 850 RPM for 3 hours.
	  o Recordings taken every 30 minutes for entire heat run.	

Problems revealed during today's tests	- Fan A Channel 2 has a failed Thyristor device in Supply Bridge Arm 4 Device 3.
	  o Device measures short circuit across anode and cathode.
	  o Faulty device did not interrupt load tests (device is redundant).
	  o We will change-out the SCR module tomorrow with customer spare.
	  o Will not be able to re-test with load until next Sunday.	

Out Standing	- Need to check remote auto controls. IPP not ready yet.	
Keep Track of Hours	- JBD: 12 hrs - MK: 12 hrs	

DELAYS	TIME

WORK AREA	DESCRIPTION OF NEXT ACTIVITIES

Signed: J. Barry Daugherty **Name:** J. Barry Daugherty / Mikhail Zakin

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ENGINEERS DAILY SITE LOG

No: JBD/IPP/17_Apr_06
Day: Monday
Date: 17 April 06
Contract No: GD70116

Contract: Intermountain Power Projects – ID Fans Upgrade

Work Area: Unit 2 Shutdown – ID Fan Commissioning

WORK AREA	DESCRIPTION OF WORK CARRIED OUT/ PROBLEMS	TASK CODES
Documentation	- Constructed graphs to depict results of Output Voltage Tests. Inserted them into the Commissioning files.	
Fan A Channel 2	- Replaced SCR Module SA1 (bad Thyristor found during yesterday's load tests). o Cannot perform pulse test as 480 VAC is not available. o Cannot perform cooling water flow check as 480 VAC is not available. o Work was performed by IPP Technicians under Converteam supervision.	
HMI Local Spd Ref	- Tested changes made by Cliff Watson to correct the problem with HMI Local Speed Ref not working correctly. o Still not working satisfactorily. o Under investigation.	
Outstanding	- Need to check remote auto controls. IPP not ready yet. - Diagnostics systems need checked; cannot do as 480 VAC not available. - Problem with Local Start sometimes not working under investigation. - Motor Current sliding bar on HMI Local Control screen scaling needs corrected. - Fan A Channel 2 SCR Module SA1 needs pulse tests performed (480 VAC not available to power gating PSU). - Fan A Channel 2 SCR Module cooling water flow needs checked (480 VAC not available to power cooling water pumps). - All electrical connections to be re-torqued during down time. - Documentation: Commissioning files need completed/updated with all test results & traces.	
Keep Track of Hours	- JBD: 8 hrs - MK: 8 hrs	

DELAYS	TIME

WORK AREA	DESCRIPTION OF NEXT ACTIVITIES

Signed: _____ **Name:** _____

Original- Site

CONVERTEAM
THE POWER CONVERSION COMPANY

ENGINEERS DAILY SITE LOG

No: JBD/IPP/18_Apr_06
Day: Tuesday
Date: 18 April 06
Contract No: GD70116

Contract: Intermountain Power Projects – ID Fans Upgrade

Work Area: Unit 2 Shutdown – ID Fan Commissioning

WORK AREA	DESCRIPTION OF WORK CARRIED OUT/ PROBLEMS	TASK CODES
HMI Local Spd Ref	- Tested new changes made by Cliff Watson to correct the problem with HMI Local Speed Ref not working correctly. o Referencing is now working correctly. o Downloaded to each drive with correct IP address.	
Remote running	- Started Fan C Channel 1 in remote and ran at 150 RPM (Turn-in Gear speed). o Several field wiring problems found and corrected. o Field wiring problems will be corrected for each drive.	
Stator Voltage FB	- Stator voltage feedback verified in 1C1 drive.	
Outstanding	- Need to check remote auto controls. IPP not ready yet. - Diagnostics systems need checked; cannot do as 480 VAC not available. - Problem with Local Start sometimes not working under investigation. - Motor Current sliding bar on HMI Local Control screen scaling needs corrected. - Fan A Channel 2 SCR Module SA1 needs pulse tests performed (480 VAC not available to power gating PSU). - Fan A Channel 2 SCR Module cooling water flow needs checked (480 VAC not available to power cooling water pumps). - All electrical connections to be re-torqued during down time. - Documentation: Commissioning files need completed/updated with all test results & traces.	
Keep Track of Hours	- JBD: 8 hrs - MK: 8 hrs	

DELAYS	TIME

WORK AREA	DESCRIPTION OF NEXT ACTIVITIES

Signed: J. Wm Duff **Name:** _____

Original- Site

CONVERTEAM
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ENGINEERS DAILY SITE LOG

No: JBD/IPP/19_Apr_06
Day: Wednesday
Date: 19 April 06
Contract No: GD70116

Contract: Intermountain Power Projects – ID Fans Upgrade

Work Area: Unit 2 Shutdown – ID Fan Commissioning

WORK AREA	DESCRIPTION OF WORK CARRIED OUT/ PROBLEMS	TASK CODES
HMI	- Corrected problem with Current Feedback indication on Local Control mimic. - Changed the conductivity trend display to reflect new alarm level of 0.5 uS/cm. - Unable to download new HMI program to Fan D Channel 2. Requested spare HMI from IPP.	
Fan A Ch 2 supply bridge	- Performed full pulse test (no HV) on the supply bridge since spare SCR module was installed. - Also performed cooling water flow check through the supply bridge.	
Local Start Problem	- Found the problem as to why customer is sometimes unable to start the drives in local. o Discovered it happens when speed <90 RPM o Discovered it happens if stop command was given previously o Discovered it is ok if switched from Local to Remote and back. o Found and corrected problem in program o No chance to test yet.	
Converter Diagnostics	- Discovered that the Diagnostics system is disabled when the MSR (minimum speed relay) not on. o The logic that drives this relay was changed at the customers request near the end of commissioning last year. Relay is now off above minimum speed. o Logic for disabling Diagnostics needs changed (see rung writing to L7324). We suggest replacing NC B3.1 with NC G52.0 (running). o Testing will be required.	
Stator Voltage FB	- Stator voltage feedback verified in 1C1 drive.	
Outstanding	- Need to check remote auto controls. IPP not ready yet. - Diagnostics systems need checked; cannot do as 480 VAC not available. - Problem with Local Start sometimes not working under investigation. - Motor Current sliding bar on HMI Local Control screen scaling needs corrected. - Fan A Channel 2 SCR Module SA1 needs pulse tests performed (480 VAC not available to power gating PSU). - Fan A Channel 2 SCR Module cooling water flow needs checked (480 VAC not available to power cooling water pumps). - All electrical connections to be re-torqued during down time. - Documentation: Commissioning files need completed/updated with all test results & traces.	
Keep Track of Hours	- JBD: 8 hrs - MK: 8 hrs	

DELAYS	TIME

WORK AREA	DESCRIPTION OF NEXT ACTIVITIES

Signed: _____ **Name:** _____

Original- Site

CONVERTEAM
THE POWER CONVERSION COMPANY

ENGINEERS DAILY SITE LOG

No: JBD/IPP/20_Apr_06
Day: Thursday
Date: 20 April 06
Contract No: GD70116

Contract: Intermountain Power Projects – ID Fans Upgrade

Work Area: Unit 2 Shutdown – ID Fan Commissioning

WORK AREA	DESCRIPTION OF WORK CARRIED OUT/ PROBLEMS	TASK CODES
Stator Voltage FB	- Made required changes to Stator Voltage Feedback scaling in Sigma and HMI according to Sid Pants instructions (changed from 4160V=100% to 4070V=100%). - Changes tested on Fan C – ok.	
Remote Running	- Remote control testing of Fan A.	
D Fan Channel 1 HMI	- NCR completed and HMI shipped to Pittsburgh for Tuesday delivery.	
Outstanding	- Need to complete check of remote auto controls. In progress. - All electrical connections to be re-torqued during down time (in progress). - Documentation: Commissioning files need completed/updated with all test results & traces (in progress). - Need to test fix for local start problem. - No decision from customer about 2nd load run test as requested by Sid Pant. - No decision from customer about changing Thyristor in fault SCR module.	
Keep Track of Hours	- JBD: 8 hrs - MRZ: 8 hrs	

DELAYS	TIME

WORK AREA	DESCRIPTION OF NEXT ACTIVITIES

Signed: _____ **Name:** _____

Original- Site

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ENGINEERS DAILY SITE LOG

No: JBD/IPP/21_Apr_06
Day: Friday
Date: 21 April 06
Contract No: GD70116

Contract: Intermountain Power Projects – ID Fans Upgrade

Work Area: Unit 2 Shutdown – ID Fan Commissioning

WORK AREA	DESCRIPTION OF WORK CARRIED OUT/ PROBLEMS	TASK CODES
2nd Load Tests	- Customer declines our request to repeat load test run to test new supply transformer tap settings and to test stator voltage feedback scalar changes (was 4160, now 4070Vac = 100%). o This information was provided to us by Nathan Crop. o If more info is required please contact the appropriate party.	
Failed SCR device replacement	- Customer declines our request to replace failed Thyristor in SCR Module on-site. The customer prefers to send the unit back to Pittsburgh Factory for repair. o This information was provided to us by Nathan Crop. o If more info is required please contact the appropriate party.	
Documentation	- Worked on Commissioning File / Report documentation	
Outstanding	- Need to complete check of remote auto controls. In progress. - All electrical connections to be re-torqued during down time (in progress). - Documentation: Commissioning files need completed/updated with all test results & traces (in progress). - Need to test fix for local start problem.	
Keep Track of Hours	- JBD: 8 hrs - MRZ: 8 hrs	

DELAYS	TIME

WORK AREA	DESCRIPTION OF NEXT ACTIVITIES

Signed: _____ **Name:** _____

Original- Site

IP7015366

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Commissioning Schedule for IPP Dual Channel ID Fans (Unit 1C & 1D)

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
MARCH 06, 2005	**MARCH 07, 2005** JBD Travel to site	**MARCH 08, 2005** - Installation Inspection - Begin Shipping Split re-connections	**MARCH 09, 2005** - Complete Shipping Split connections. - Start filling water cooling systems.	**MARCH 10, 2005** - Temporary power to cooling pumps. Purge systems of air. - Organize test areas, equipment, docs, etc. MZ Travel to site	**MARCH 11, 2005** - Begin Low Voltage Power-up Checks. - Begin I/O checks - Run water cooling systems.	**MARCH 12, 2005** - Continue I/O checks - Test ACCB trip circuits. - Check/adjust water cooling flows. - Start pulse checks on D Fan
MARCH 13, 2005 - Complete I/O checks. - Complete Pulse tests on D Fan. - Start Pulse checks on C Fan. - H/W Overcurrent trip tests. - Field Exciter Tests	**MARCH 14, 2005** - Motor disconnect switches tested. - Complete pulse checks. - Diagnostics tests as per commissioning inst. - Start HV tests on D	**MARCH 15, 2005** - Continue HV Tests for D Fan - Open Circuit Tests - Short Circuit Tests	**MARCH 16, 2005** - Complete Fan D HV Tests. - Move test equipment to Fan C Drives. - Start HV Tests for Fan C Drives.	**MARCH 17, 2005** - Continue HV Tests for Fan C drives. - Open Circuit Tests - Short Circuit Tests	**MARCH 18, 2005** .- Complete HV Tests for Fan C drives.	**MARCH 19, 2005** - Check readiness of C and D motors for preliminary rotations. - Prepare for preliminary rotation tests
MARCH 20, 2005 - Begin Single Channel No-Load rotation tests. - Fan D encoder alignment CH2 - Fan D encoder alignment CH1 .	**MARCH 21, 2005** - Single Channel No-Load tests continue. - Fan C encoder alignment CH2 - Fan C encoder alignment CH1 .	**MARCH 22, 2005** - Single Channel No-Load tests continue. - Fan D Exciter phase rotation checks. - Fan C Exciter phase rotation checks. **REQUIRES TOP SPEED**	**MARCH 23, 2005** - Single Channel No-Load tests continue. - Fan D Speed Regulator Control - Fan C Speed Regulator Control checks. **REQUIRES TOP SPEED**	**MARCH 24, 2005** - Single Channel No-Load tests continue. - Fan D V/F control checks. - Fan C V/F control checks. **REQUIRES TOP SPEED**	**MARCH 25, 2005** - Dual Channel No-Load tests. - Stop/Start tests Fan D - Operational & Stability checks Fan D - Master/Slave switch-over tests – Fan D.. **REQUIRES TOP SPEED**	**MARCH 26, 2005** - Dual Channel No-Load tests continue. - Stop/Start tests Fan C - Operational & Stability checks Fan C - Master/Slave switch-over tests – Fan C **REQUIRES TOP SPEED**
MARCH 27, 2005 - Single Channel Load Tests - Repeat V/F Control Tests with load on all four channels. **REQUIRES FULL LOAD**	**MARCH 28, 2005** - Dual Channel Full Load Tests - Full load current checks. Perform on both fans. **REQUIRES FULL LOAD**	**MARCH 29, 2005** - Dual Channel Full Load Tests - Beta and recovery time checks., Estop, master slave switchover.. Perform on both fans. **REQUIRES FULL LOAD**	**MARCH 30, 2005** - Monitor performance of drives. - Provide informal training for customer	**MARCH 31, 2005** - Monitor performance of drives. - Provide informal training for customer.	**APRIL 1, 2005** - Monitor performance of drives. - Provide informal training for customer.	**APRIL 2, 2005** - Monitor performance of drives. - Provide informal training for customer. **ID FANS TURNED OVER TO IPSC OPS**
APRIL 3, 2005 - Monitor performance of drives. - Provide informal training for customer.	**APRIL 4, 2005** - Monitor performance of drives. **UNIT 2 GEN AT FULL LOAD**	**APRIL 5, 2005** - Monitor performance of drives.	**APRIL 6, 2005** - Monitor performance of drives.			

30 day schedule for ID fan outage April 2006

April 1, 2006

9:00 AM

a. Sign on to clearances for Unit 2 ID fans 1A, 1B and 1C. Have all electrical contractors sign on.

b. Sign on clearance on Unit 2

March 30, 2006 (Friday)

7:00 PM

- If clear skies stage the new drives near second story balcony of scrubber building (They are located in warehouse four (4)).
- Prepare balcony doorway by temporarily removing the guard rail.

April 1, 2006 (Saturday morning - beginning of outage)

7:00 AM

- Sign on all clearances as soon as possible.

Finish the following before 7:00 AM April 4, 2006.

- Carefully label all circuits, including high voltage circuits connected to all six (6) ID fan drives.
- Disconnect the existing ventilation ducts and cover with provided vent covers.
- After all cables and ducts are removed, dissassemble and remove the existing drives. Transport the old Westinghouse drives to the warehouse four (4) to where the new drives were taken out previously.
- Install, level, assemble the new drives. Anchoring all cabinets.
- Re-connect all circuits as per alstom drawings.
- Pull the two (2) new cables that go between the channel one and two for 'A', 'B' and 'C' ID fan drives.
- Pull the four (4) replacement cables that go from the regulator to the link reactor for channels 1A1, 1A2, 1C1 and 1C2.
- Pull the six (6) replacement cables that go from 1A1, 1A2, 1B1, 1B2, 1C1 and 1C2 down to the west side of the scrubber building on first floor where you find the remote I/O cabinets.
- Re-route the cables that used to go to the ID fan annunciator (East side of the ID fan drive room) so they end up in each corresponding regulator cubicle.
- Install new relay in all six (6) 6.9 KV feeder breaker cabinets as per drawings (Remember reverse labeling).
- Support all high voltage cables using plastic uni-strut clamped to I-Beams and cable clamps.
- cover all high voltage terminations with either red heat shrink wrap or rubber-boots as supplied by IPSC.
- Re-tap the 6 corresponding isolation transformers as directed by engineering.
- Place anti-frictional rubber matting under all HV cables where they touch the concrete floor to prevent erosion over time.
- Re-tap the DC-Link reactors as directed by engineering. (Should be made to be 12.1mH)
- Carefully verify the new drives are wired correctly, all cables are labeled.
- Terminate the encoder wiring in the jbx that you installed before the outage.
- Assume 30 hours of start-up support for each drive. This amount will be adjusted, based on the time and material rates submitted in the bid, to cover actual hours.

IPSC April 2006 outage schedule for ID fan drive replacement
Nathan Crop
December 20, 2005

Pre-outage

1) Pull all 120 VAC power (but not terminate) for U1 and U2 ID fan drives (#8 wire).
2) Pull all the encoder cables (But not terminate) and install conduit and jbx for encoder signals.
3) Pull Cat5 cable enclosed the innerduct as provided. The cat5 cable will go from each regulator cabinet all the way to inside a data acquisition room beneath the 1D1 drive on first floor of the scrubber building. For the 2 cat5 cables from 1A1 and 1A2 it will be no longer than 100 feet. For the 1B1 and 1B2 drives the cat5 cable run will be no longer than 70 feet. For the 1C1 and 1C2 drives the cat5 cable run will be no longer that 40 feet. These cable runs must stay in the control cable trays and not be in the 480 or higher cable trays.

March 30, 2006 (Friday)

7:00 PM

- If clear skies stage the new drives near second story balcony of scrubber building (They are located in warehouse four (4)).
- Prepare balcony doorway by temporarily removing the guard rail.

April 1, 2006 (Saturday morning - beginning of outage)

7:00 AM

- Sign on all clearances as soon as possible.

Finish the following before 7:00 AM April 4, 2006.

- Carefully label all circuits, including high voltage circuits connected to all six (6) ID fan drives.
- Disconnect the existing ventilation ducts and cover with provided vent covers.
- After all cables and ducts are removed, dissassemble and remove the existing drives. Transport the old Westinghouse drives to the warehouse four (4) to where the new drives were taken out previously.
- Install, level, assemble the new drives. Anchoring all cabinets.
- Re-connect all circuits as per alstom drawings.
- Pull the two (2) new cables that go between the channel one and two for 'A', 'B' and 'C' ID fan drives.
- Pull the four (4) replacement cables that go from the regulator to the link reactor for channels 1A1, 1A2, 1C1 and 1C2.
- Pull the six (6) replacement cables that go from 1A1, 1A2, 1B1, 1B2, 1C1 and 1C2 down to the west side of the scrubber building on first floor where you find the remote I/O cabinets.
- Re-route the cables that used to go to the ID fan annunciator (East side of

the ID fan drive room) so they end up in each corresponding regulator cubicle.

- Install new relay in all six (6) 6.9 KV feeder breaker cabinets as per drawings (Remember reverse labeling).
- Support all high voltage cables using plastic uni-strut clamped to I-Beams and cable clamps.
- cover all high voltage terminations with either red heat shrink wrap or rubber-boots as supplied by IPSC.
- Re-tap the 6 corresponding isolation transformers as directed by engineering.
- Place anti-frictional rubber matting under all HV cables where they touch the concrete floor to prevent erosion over time.
- Re-tap the DC-Link reactors as directed by engineering. (Should be made to be 12.1mH)
- Carefully verify the new drives are wired correctly, all cables are labeled.
- Terminate the encoder wiring in the jbx that you installed before the outage.
- Assume 30 hours of start-up support for each drive. This amount will be adjusted, based on the time and material rates submitted in the bid, to cover actual hours.

IPSC April 2006 outage schedule for ID fan drive replacement
Nathan Crop
January 9, 2006

Pre-outage

1. Pull all 120 VAC power (but not terminate) for U1 and U2 ID fan drives (#8 wire).
2. Pull all the encoder cables (But not terminate) and install conduit and jbx for encoder signals.
3. Pull Cat5 cable enclosed the innerduct as provided. The cat5 cable will go from each regulator cabinet all the way to inside a data acquisition room beneath the 1D1 drive on first floor of the scrubber building. For the 2 cat5 cables from 1A1 and 1A2 it will be no longer than 100 feet. For the 1B1 and 1B2 drives the cat5 cable run will be no longer than 70 feet. For the 1C1 and 1C2 drives the cat5 cable run will be no longer that 40 feet. These cable runs must stay in the control cable trays and not be in the 480 or higher cable trays.

March 29 and 30, 2006 (Friday)

1. If clear skies stage the new drives near second story balcony of scrubber building (They are located in warehouse four (4)). With much patience and care taken with expensive material.
2. Prepare balcony doorway by temporarily removing the guard rail.

April 1, 2006 (Saturday morning - beginning of outage)
9:00 AM

1. Sign on all clearances as soon as possible.

Finish the entire installation before 9:00 AM April 5, 2006.
The work scope previously submitted gives a more comprehensive list of the work needed to be done. This is a rough outline.
1) Install new 120 volt power cable from the essential services power panels in the generating station control building to the new drives using existing cable tray, duct bank and wireway. New cable will be installed for all eight Unit 2 variable frequency drives. The power cables for the Unit 2 ID fan drives will be connected to each drive in the regulator cabinets. The cable for the drives can be pulled before the outage and coiled under the drives so they are ready to go when the outage begins. The cable must be installed but not connected at either end before March 1, 2006. The cable is three conductor # 8 tray cable with a separate ground conductor. Cable shall be routed to match the existing two conductor #12 tray cable routing for circuits 2CCEK2121B13, 2CCEK2122B13, 2CCEK2123B13, 2CCEK2124B13, 2CCEK2125B13, 2CCEK2126B13, 2CCEK2127B13, 2CCEK2128B13, and 2CCEK2122B13. When connecting these circuits disconnect and abandon the old cables that these cables will replace.

2) Install new 120 volt power cable from the essential services power panels in the generating station control building to the new drives using existing cable tray, duct bank and wireway. New cable will be installed for all eight Unit 1 variable frequency drives. The power cables for the Unit 1 ID fan drives will be connected to each new drive in the regulator cabinets. The cable for the drives can be pulled before the March outage and coiled under the drives so they are ready to go when the March short outage begins. The cable must be installed but not connected at either end before Feb 20, 2006. The cable is three conductor # 8 tray cable with a separate ground

conductor. Cable shall be routed to match the existing two conductor #12 tray cable routing for circuits 1CCEK2121B13, 1CCEK2122B13, 1CCEK2123B13, 1CCEK2124B13, 1CCEK2125B13, 1CCEK2126B13, 1CCEK2127B13, 1CCEK2128B13, and 1CCEK2122B13. When connecting these circuits disconnect and abandon the old cables that these cables will replace.

3)Carefully identify and label all circuits, including the high voltage (15 KV rated) circuits between the drive cabinets and the transformer, from the drive motor operated switch and between the drive and motor, connected to the existing Unit 2 'A', 'B' and 'C' drives and then disconnect the circuits and carefully coil them in the cable trays located under the drives. The inspection and labeling of control and low voltage power (< 480 volts AC) circuits may be completed before the existing drives are removed from service. The cables may be disconnected, after the proper authorizations are obtained (Clearances), on April 2, 2006 beginning at 7:00 am.

4) Disconnect the existing heating and ventilating duct and cover the square ducts with provided vent covers. (Need seal putty for the re-closure of the ductwork).

5) After all the cables and duct have been removed, disassemble and remove the existing drives. The existing drive dimensions and weights are shown on drawing 63.2203.05-90025. The Contractor shall carefully remove the drives and transport them to a warehouse at the generating station site (Approximately 0.75-1.0 mile away). He can take the old drives over to the warehouse after the 5th of April.

6) Install the new drives. The new drives are being stored in warehouse number 4. The new drives shall be carefully assembled and leveled by install shims between the concrete floor and drive cabinet floor rails. All hinged cabinet doors are to be fully functional after assembly. Anchor depth shall satisfy the seismic design requirement where seismic use group is III.

7) Reconnect the circuits except for the circuits to the annunciator and the trip panel. Reconnect the high voltage cable to the motor so the phasing is the same as was before disassembly. The circuits to the annunciator and trip panel shall be modified as shown on the drawings. All the high voltage cables will be supported inside cabinets and under the floors with cable clamps on uni-strut that is clamped to the I-beams (All clamps and uni-strut provided by IPSC) . There must be anti-frictional buffer material between all cables and the cement floor to prevent distortion of the cables over time.

8) Install one new relay in each of the six (6) feeder breaker cabinets as described in drawings 63.3601.05-20234 and 2CCE-K2111C. SIS #12 will be provided by owner. Remember to implement reverse labeling.

9) Install two (2) new control circuits between the two drives for each fan. These circuits shall be installed in the existing cable tray below each drive. The cable for these control circuits are seven (7) conductor #14 tray cable (Cable provided by IPSC).

10) Install six (6) new control circuits from the corresponding remote I/O cabinets to 1A1, 1A2, 1B1, 1B2, 1C1 and 1C2 drive regulator cabinets. These cables go to the regulator cabinet instead of the incoming cabinet as they were wired on the old Westinghouse drives. The cable for these control circuits will need to be two (2) conductor #14 at a length of no more than 170 feet. The circuit numbers are 2CCEK2121B15, 2CCEK2122B15, 2CCEK2123B15, 2CCEK2124B15, 2CCEK2125B15, 2CCEK2126B15. Disconnect and abandon the old cables that these cables will replace (Cable provided by IPSC).

11) Install four (4) new control circuits from the corresponding smooth reactors to their individual regulator cabinets on the 1B1, 1B2, 1C1 and 1C2. The cable for these control circuits are two (2) conductor #14 tray cable. Each cable will be no longer than 60 feet. The circuit numbers are 2CCEK2123B03, 2CCEK2124B03, 2CCEK2125B03, 2CCEK2126B03 (Cable provided by IPSC). Disconnect and abandon the old cables that these cables will replace.

12) Install anti-friction support for all high voltage cabling under three (3) cabinets for all of the 6 drives. This requires I-beam clamps and non-conducting uni-strut material provided by IPSC. Inside cabinets 7/16 inch tye-raps may be used.

13) Disconnect the isolation transformer temperature indication circuits to the annunciator and re-route the circuits to the variable frequency drive regulator cabinet.

14) Re-tap the 6 corresponding isolation transformers as directed by engineering.

15) Re-tap the DC-Link reactors as directed by engineering. (Should be made to be 12.1mH). The reactor taps are clearly marked.

16)Carefully verify the new drives are wired correctly, all cables are labeled and provide as built drawings of the new wiring (Alstom drawings with notes). The installation of the new drives must be completed by April 5, 2006 9:00 AM in the morning.

17) Install a junction box, conduit and wiring for a new motor shaft mounted encoder for the fan drive motors. This work must be completed by February 20, 2006. Except for the final terminations, the installation of the junction box, conduit and new cables for the encoder can be completed in January or early February. Two (2) cables per fan will be pulled. The cables will be four (4) pr #16 tray cable approximately 500 feet in length. Except for a pair of 20 foot conduit runs, this cable shall be installed in existing raceway.

17 a) On the three (3) ID fan motors install a 5 foot (Rigid Metal)conduit run from the junction box installed in part (17) to the other side of the motor exciter housing to run encoder cables into motor housing. Pull the six (6) encoder cables through the five (5) foot conduit and land them on the encoder sensor fixtures.

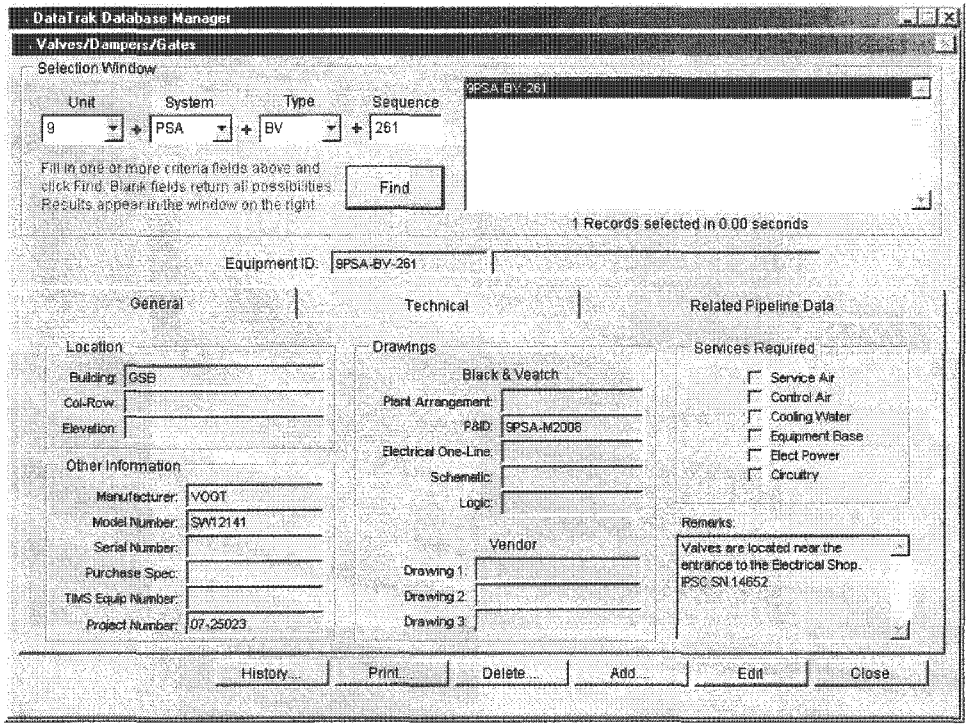
17 b) On the three (3) ID fan motors run a flexible water proof conduit from the junction added in part (17) to the box adjacent to it. Then pull the one (1) twisted pair cable through the two (2) foot flexible conduit and land in the box adjacent to the encoder box.

18) Provide start-up support for the drives. Assume 30 hours of start-up support for each drive. This amount will be adjusted, based on the time and material rates submitted in the bid, to cover actual hours.

19. If unit 1 is down on load we will put a clearance on the 1D1 and 1D2 channels in unit one and proper cable support will be installed for the 500 kcmil cables on those drives. This was not done last year.

Materials Supplied by Owner:

variable frequency drive assemblies - two each for the 'A', 'B' & 'C' ID fans
seven (7) conductor #14 tray cable
five (5) conductor #12 tray cable
four (4) pr #16 tray cable
three (3) conductor #8 tray cable
Three (3) encoder assemblies and associated junction boxes
four (4) current sensing relays
three (3) encoder jbx's with backplates
fibreglass unistrut for High Voltage cable support
cable clamps for High Voltage cable support
I-beam clamps for High Voltage cable support
rubber sheeting for a buffer between cables and hole edge in concrete floor.
Stainless steel bolts for terminating High Voltage cables
Split bolts for grounding High Voltage shields.
2X4 wood for making skid to hold old drives in warehouse.
Insulation tape or covers for the high voltage terminations
duct covers
Cat-5 cable and inner-duct


DataTrak Database Manager
Valves/Dampers/Gates
Selection Window
Unit
System
Type
Sequence
9
PSA
BV
261
Fill in one or more criteria fields above and click Find. Blank fields return all possibilities. Results appear in the window on the right.
Find
9PSA-BV-261
1 Records selected in 0.00 seconds
Equipment ID: 9PSA-BV-261
General
Technical
Related Pipeline Data
Location
Building: GSB
Col-Row:
Elevation:
Other Information
Manufacturer: VOGT
Model Number: SW12141
Serial Number:
Purchase Spec:
TIMS Equip Number:
Project Number: 07-25023
Drawings
Black & Veatch
Plant Arrangement:
P&ID: 9PSA-M2008
Electrical One-Line:
Schematic:
Logic:
Vendor
Drawing 1:
Drawing 2:
Drawing 3:
Services Required
Service Air
Control Air
Cooling Water
Equipment Base
Elect Power
Circuitry
Remarks:
Valves are located near the entrance to the Electrical Shop. IPSC SN 14652
History...
Print...
Delete...
Add...
Edit
Close

From: Nathan Crop
To: Kevin Miller ; Nathan Crop
Date: 12/19/2005 4:32:25 PM
Subject: Fwd: ID fan outage supplies

Kevin,
The outer diameter of the 15 kv 500 KCMIL Okonite power cable is 1.57 inches.
So you can get the right size RTD cable clamps.
Nathan

>>> Nathan Crop 12/19/2005 3:26:51 PM >>>
Hello Kevin,
From past emails it looks like you still need to order these items:

1. 16 1,100 foot reels of #8 cable for 120 volt power from the ESS to the new drives. If it has to be 4 conductor thats ok. The ESS fuses are set at 10 amps so 14 gauge or larger will be fine for the ground conductor (See table 250.122 in 2005 code)

2. 150 feet of 1" Rigid Metal Conduit.

3. Two dozen couplings for the 1" conduit for splicing.

4. 110 I-beam clamps that hold plastic uni-strut to the I-beams.

5. 200 feet of plastic unistrut.

6. 130 RTD cable clamps that hold the cable to the plastic uni-strut

7. 260 - 1/4 x 12 inch tye-raps.

8. 270- ½ x 1 inch Stainless steel bolt with 270 washers, 270 lock washers, 270 nuts.

9. 170 - ½ x 1 ½ inch Stainless steel bolt with 170 washers, 170 lock washers, 170 nuts.

10. 45 - 1 inch brass split bolts for the termination of the HV cable shielding.

Please let me know which of these items needs more clarification.
Nathan

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Delta, UT 84624-9522
Telephone (435) 864-6483
home: (435) 864-8429
Fax (435) 864-6670
E-mail: nathan-c@ipsc.com

"Controlling the ID Fan Locally"

Nathan Crop 3-13-06

Starting the Delta ID fan locally

1. Turn off the drives (1A1, 1A2).

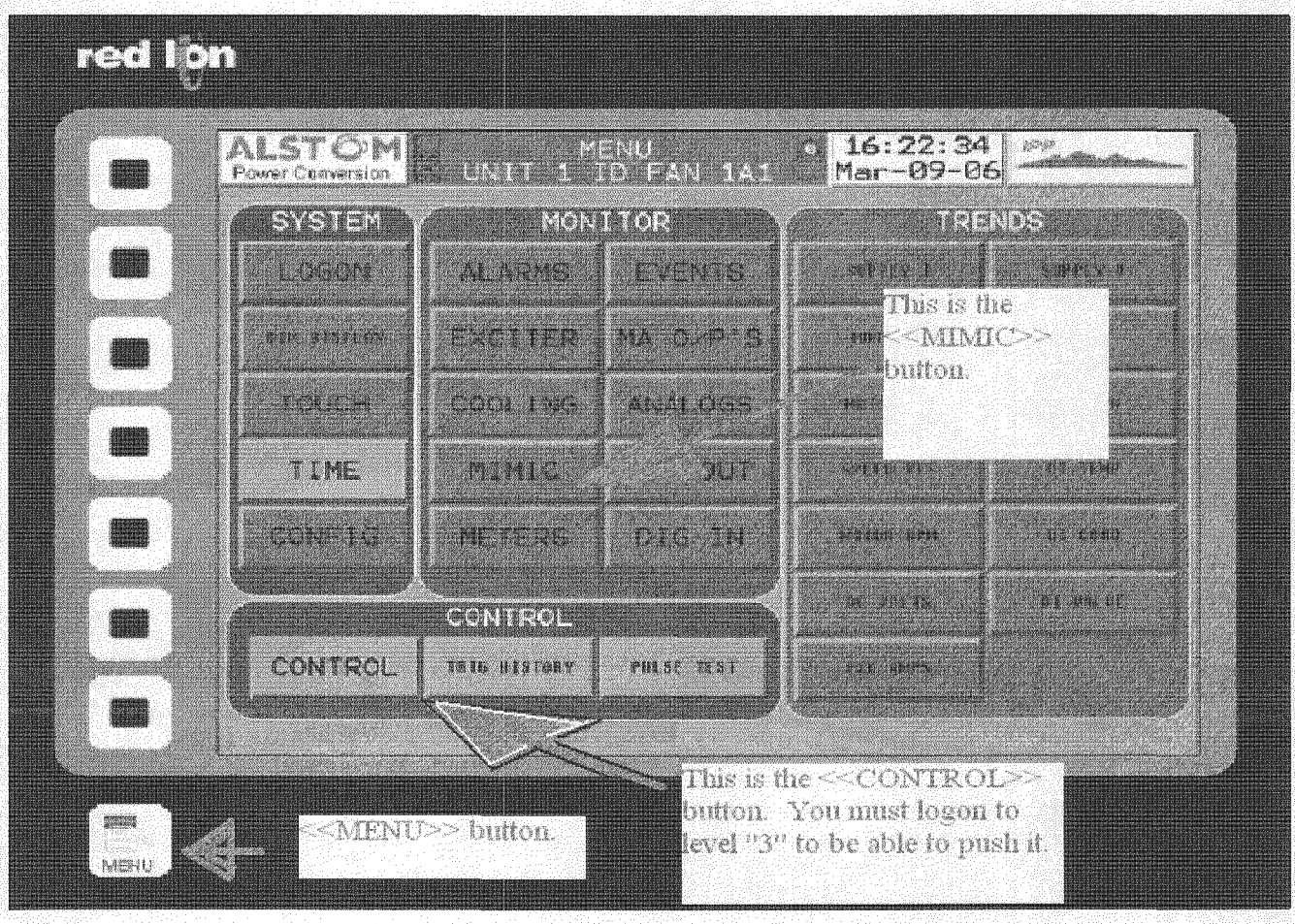
2. Drives and motor must be stopped in order to switch to the local control. Allow time for motor to coast to stop. ~10 minutes

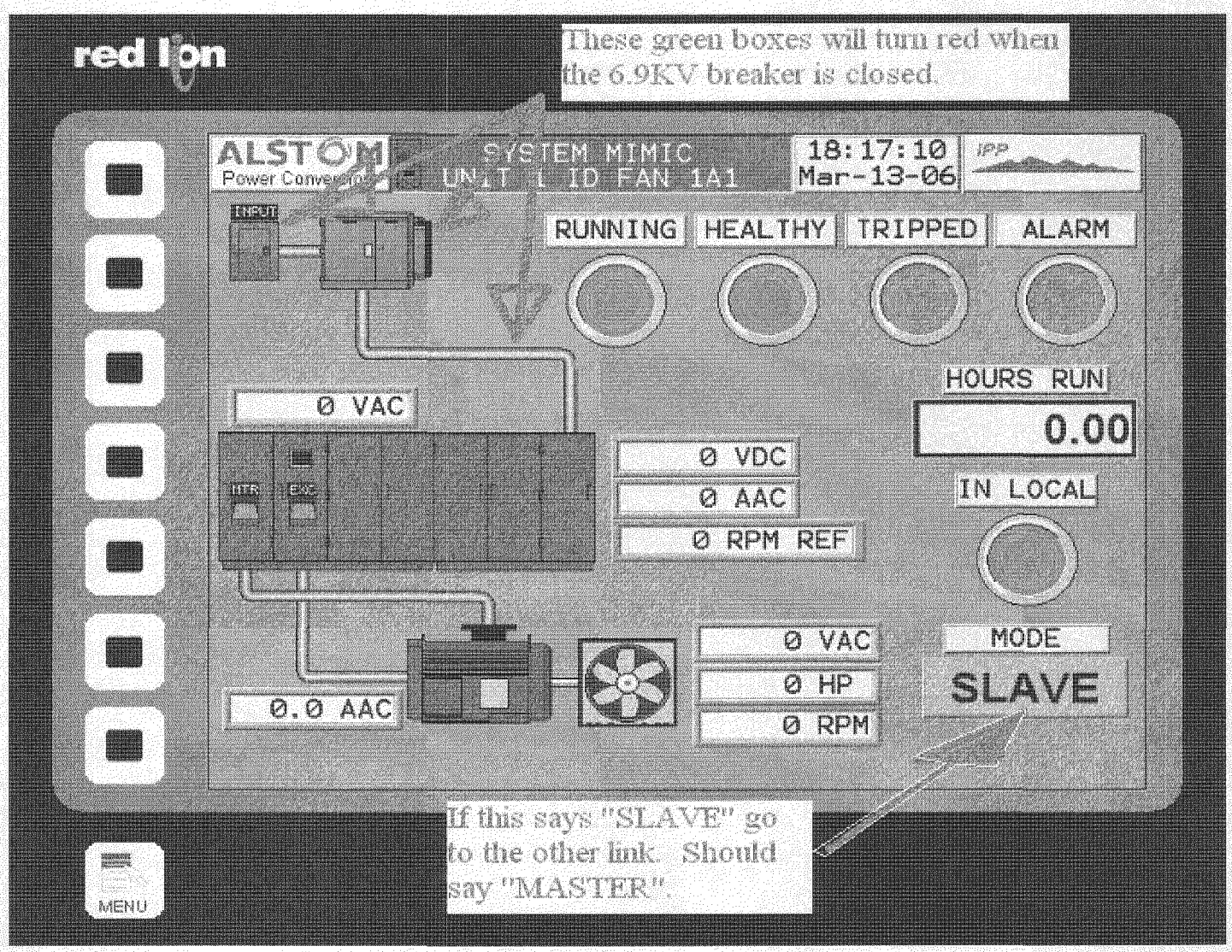
3. If you start the slave drive (only after the master is started first) make sure the speed (RPM) set point is equal to that of the motor (just in case the master trips later on). Note: For the April 2009 outage we are only using 1A1 drive. The 1A2 drive does NOT have the lube oil pressure switch wired for tripping the 6.9 in case of loss of lube oil pressure.

Instructions at the drive. (Read the following 12 steps before you proceed).

When you first get to the HMI just press the <<MENU>> button on the bottom-left.

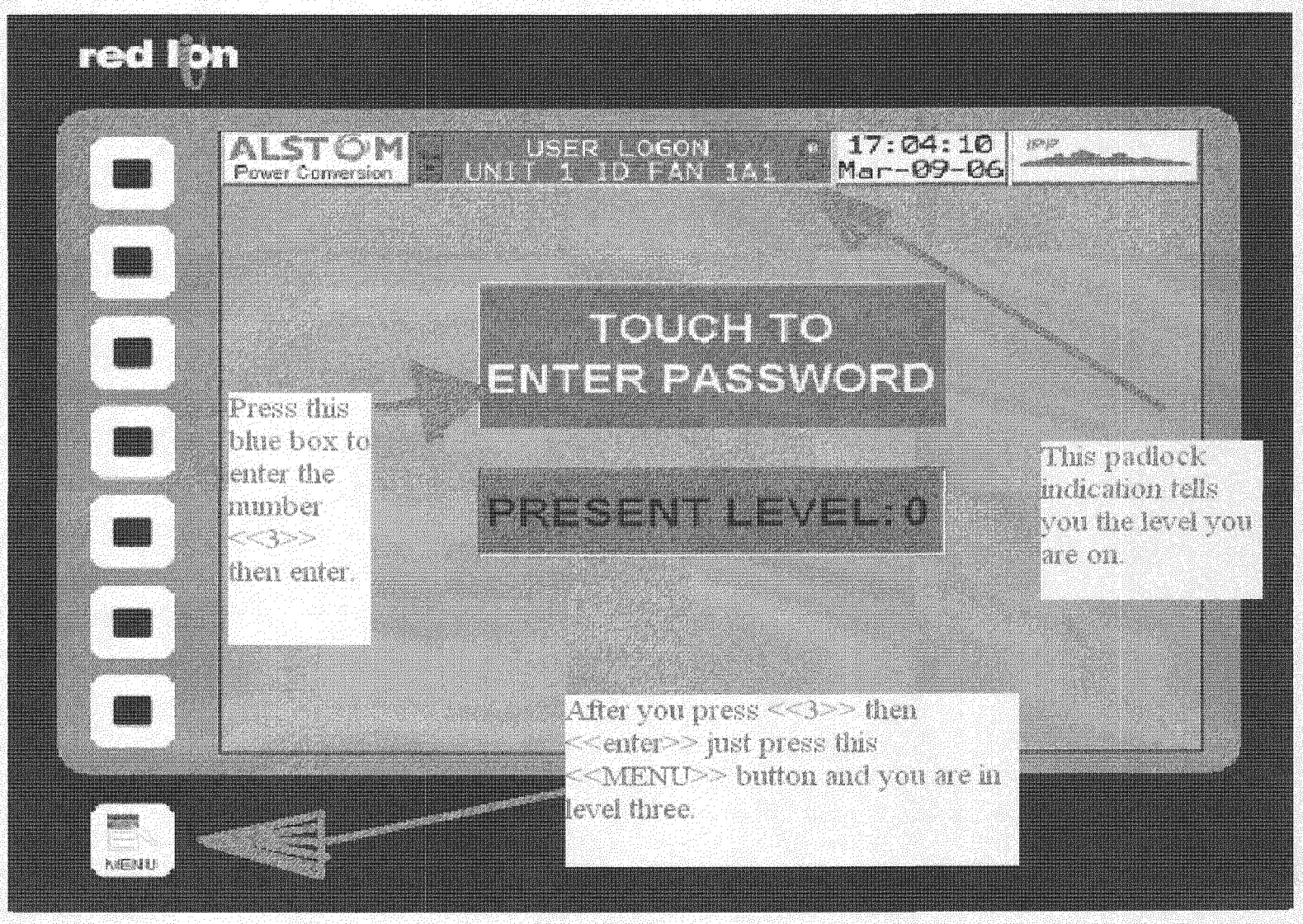
1. Go to the Master drive and press the <<MIMIC>> button (see the second figure below).
2. Verify when the 6.9KV feeder breaker is closed (see the second figure below the input box and the xfmr box turn "RED".





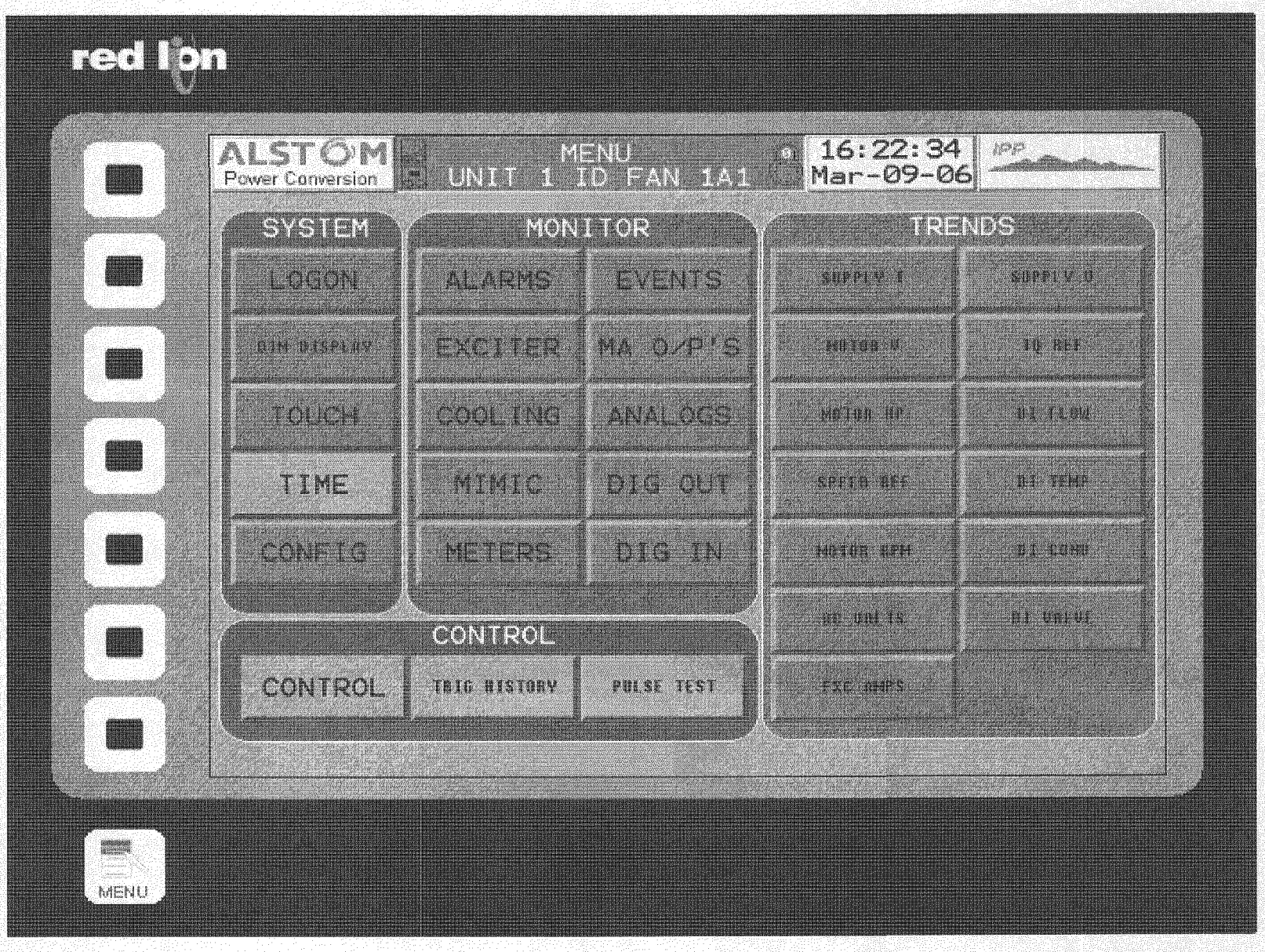
Instructions at the drive continued…

3. press the <<MENU>> button and then the <<LOGON>> button.
4. press the blue <<TOUCH TO ENTER PASSWORD>> button.
5. press the button <<symbols>> to be able choose a number (instead of a letter) and then press the <<3>> button and then enter.
6. You are now in level three (3). Press <<MENU>>.



Instructions at the drive continued…

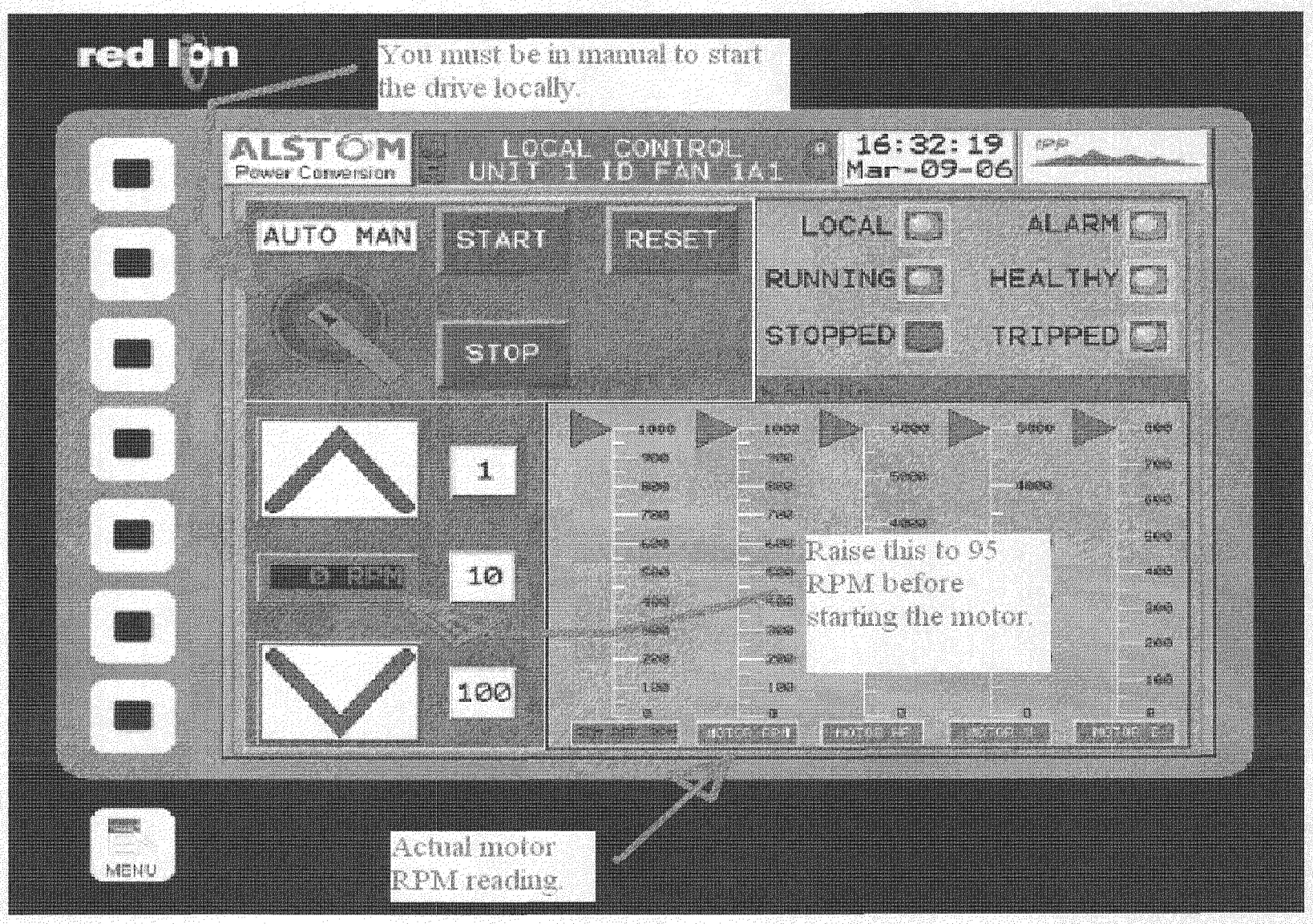
7. press the <<CONTROL>> button (If the button is grey you must re-try to logon to level "3").



Instructions at the drive continued…

8. Now press the green rotary switch labeled "AUTO MAN".
9, You should notice that the "LOCAL" indicating light turns on.
10. Double click the green RPM set point and a calculator pop-up will apear (On this pop-up raise and lower the set point).
11. Use 95 rpm as the initial speed. If the other drive is running set the speed of the slave drive equal to the fan speed.
12. The blue up and down arrows do not work (you must double click (press) on the green rpm set point (below "0 RPM").

NOTE: coordinate with an operator at the inlet damper as to when it should be opened.



"First Setting up Delta ID Fan for 2006 Outage"

Nathan Crop 3-13-06

April 1, 2006 first time

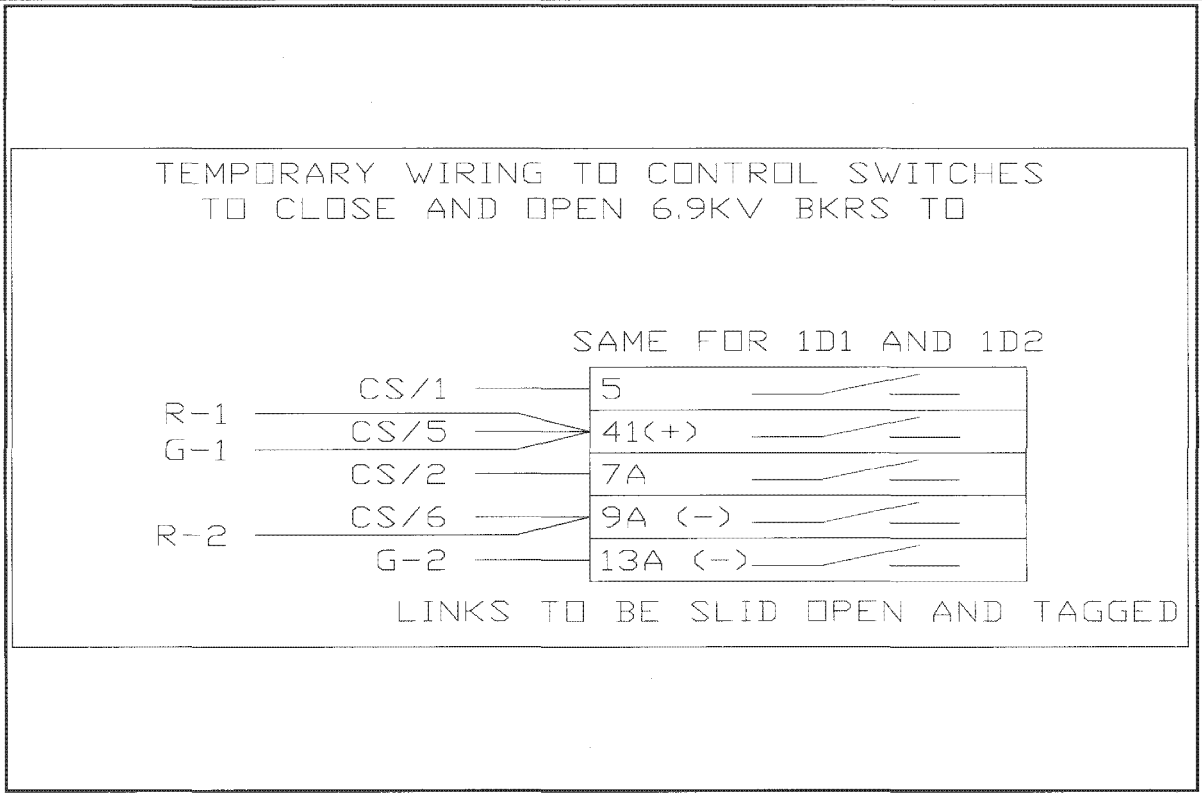
1. Pre-pull the cable from the junction box in cable spreading room to the temporary switch panel that will be located behind the control operator's desk. Do not terminate the cable until ready to switch over completely.

2. Saturday morning while Delta ID fan is still in run turn off 2CCE-CDR-92 corresponding with 2APC-MCC-2B02 bkr. # (6,D) and also turn off 2CCE-CDR-96 corresponding with 2APC-PLL-116 bkr # (2,4,6). This way the outlet dampers will remain open. Note: Now the inlet damper is all we have to isolate the air flow through the Delta ID fan.

3. Take the Delta ID fan to turning gear and have an operator turn the inlet damper close using the rotary switch (Located at base of the delta ID fan pedestal). Once the inlet damper is closed the operator can turn-off the Delta ID fan.

4. Once the Delta ID fan is off DNO the trip and close power in the switchgear 6.9 KV breakers for 1D1 and 1D2. Have Capital Electric wire the temporary control switches for the temporary control switches on the 1D1 and 1D2 6.9KV breakers.

5. Once the temporary switches are all done and the four tags are lifted put the Delta fan back in service.



Procedure for tuning the Variable Frequency Drive Shaft Encoder for ID fan 1A.
Nathan Crop

I. Setting up for the tuning of the Shaft Encoder.

A. Have electricians bring all tools, high voltage safety wear, oscilliscope and 24 VDC power supply.
B. Nathan must bring dummy resistor grid for the encoder sensors.
C. Put the two voltage dividers on the ID fan 1A pedestal
D. Put red tape around the ID fan 1A pedestal.

E. Under the "OK to Hot" operating procedure we will open the terminal boxes of the ID fan 1A and open the motor exciter housing.

(1.) Electricians must be wearing all high voltage safety apparel.
(2.) Verify that the remote control switch for the 6.9 KV feeder breaker is in the pull to lock position for both 1A1 and 1A2.
(3.) Verify that all workers under my supervision are in my sight and physically clear of high voltage leads.

II. Ensure that channel one phases lead channel two phases by 30° for clockwise rotation (For counter clockwise rotation channel 2 leads channel one).

A. Connect voltage divider high side leads to the channel one and channel two leads.
(1.) The leads should be marked T1, T2, ... thru T9.
a. Channel one voltage divider goes with T1, T2 and T3.
b. Channel two voltage divider goes with T7, T8 and T9
c. Cabling must be the same for both terminal boxes.
For example:
Phase 'A' is on T1 for channel one and phase 'A' is on T7 for channel two.
Phase 'B' is on T2 for channel one and phase 'B' is on T8 for channel two.
Phase 'C' is on T3 for channel one and phase 'C' is on T9 for channel two.
B. Once the motor is turning (90 - 150 RPM) check for proper phasing of channels by themselves.
(1.) Look with dual channel oscilloscope and verify channel one voltages:
a. Vab leads Vbc by 120 degrees.
b. Vbc leads Vca by 120 degrees.
c. Vca leads Vab by 120 degrees.
Note: this is the same for both clockwise and counter clockwise rotation. The opposite rotation is accounted for by swapping two leads in the terminal boxes.

(2.) Do the same on for the channel two voltages:

C. Tuning the encoder

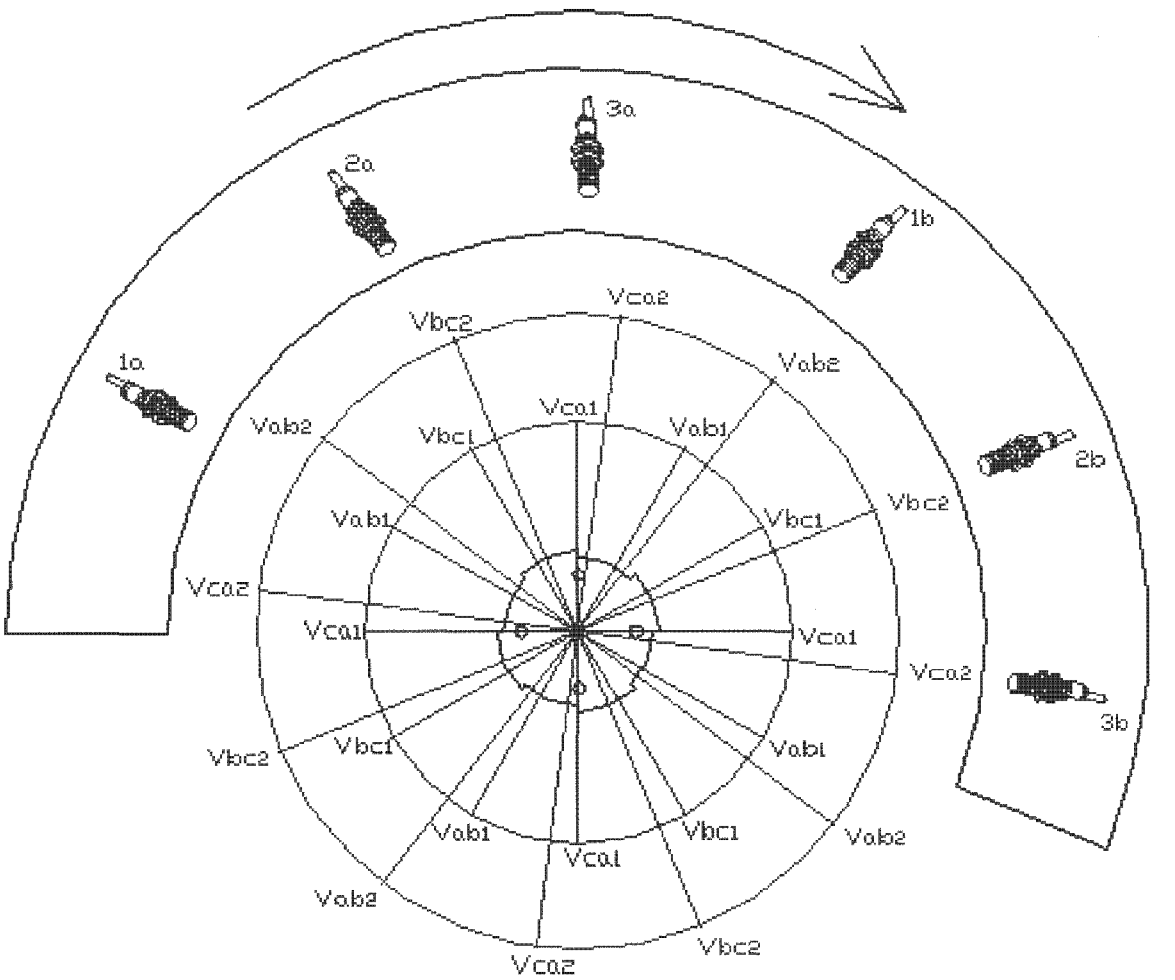
For a clockwise rotation this is how we tuned the encoder sensors.

~~(1). Make Vab1 in tune with encoder 1a.~~
~~(2). Make Vbc1 in tune with encoder 2a.~~
~~(3). Make Vca1 in tune with encoder 3a.~~
~~(4). Make Vab2 in tune with encoder 1b.~~
~~(5). Make Vab2 in tune with encoder 2b.~~
~~(6). Make Vbc2 in tune with encoder 3b.~~

Note: Actually Barry Daugherty and I found that the 1a (A32.1) for CW rotation should be tuned with Vbc1. 1b (A32.2) should be tuned with Vca1. 1c (A32.3) should be tuned with Vab1. This means you must rotate the sensor wheel CW by 30° (ie. 120° / 4 pole pairs = 30°).

(1). Make Vbc1 in tune with encoder 1a. (A32.1).
(2). Make Vca1 in tune with encoder 2a (A32.2).
(3). Make Vab1 in tune with encoder 3a. (A32.3).
(4). Make Vbc2 in tune with encoder 1b (A32.1).
(5). Make Vca2 in tune with encoder 2b (A32.2).
(6). Make Vab2 in tune with encoder 3b (A32.3).

EXAMPLE OF STATOR
MAGNETIC AXI (FOR CW ROTATION)

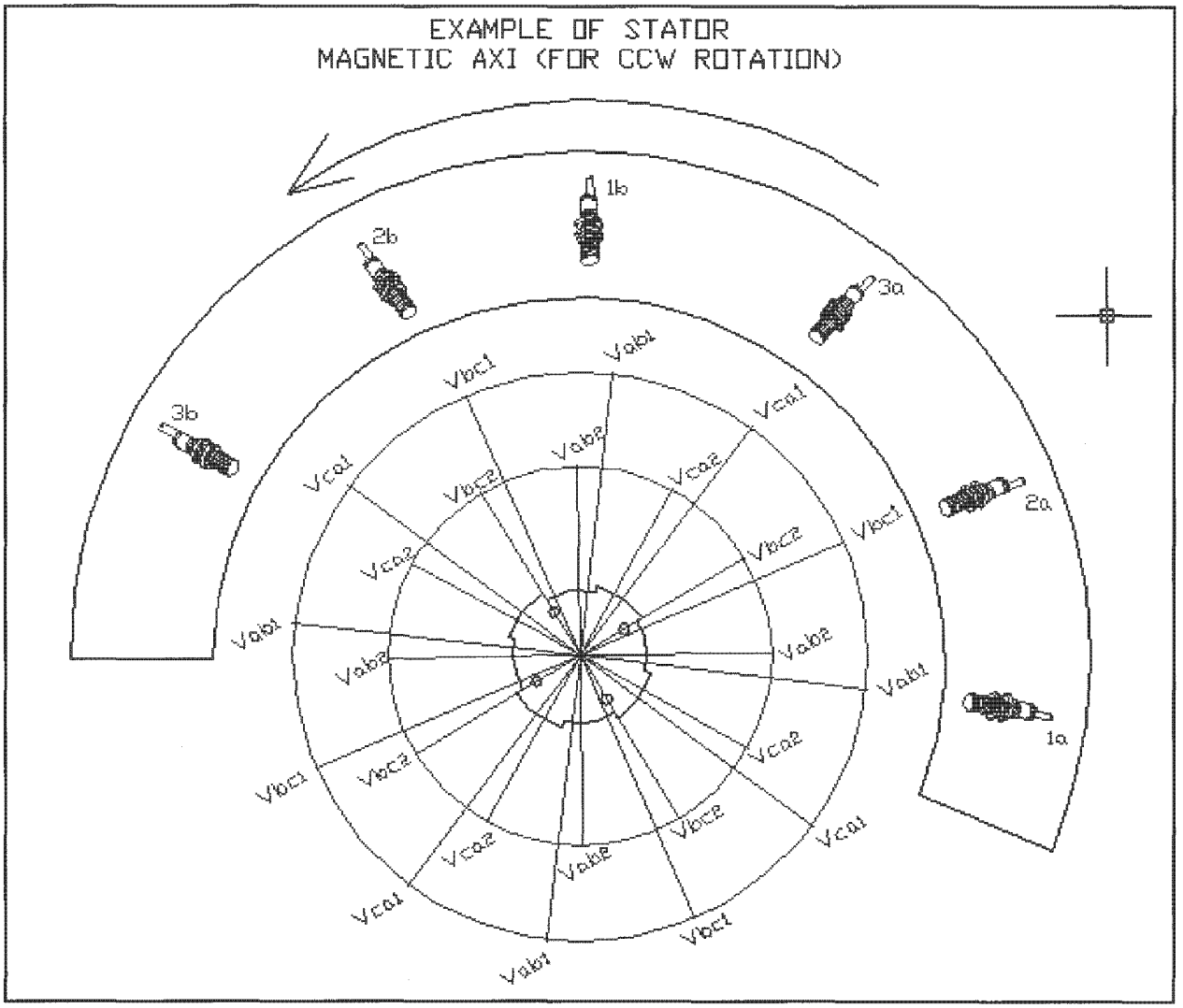


For a counter-clockwise rotation this is how we tuned the encoder sensors.

~~(1). Make Vab1 in tune with encoder 1a.~~
~~(2). Make Vbc1 in tune with encoder 2a.~~
~~(3). Make Vca1 in tune with encoder 3a.~~
~~(4). Make Vab2 in tune with encoder 1b.~~
~~(5). Make Vab1 in tune with encoder 2b.~~
~~(6). Make Vbc1 in tune with encoder 3b.~~

Note: Actually Barry Daugherty and I found that the 1a (A32.1) for CCW rotation should be tuned with Vbc1. 1b (A32.2) should be tuned with Vca1. 1c (A32.3) should be tuned with Vab1. This means you must rotate the sensor wheel by 30° (ie. 120° / 4 pole pairs = 30°).

(1). Make Vbc1 in tune with encoder 1a.
(2). Make Vca1 in tune with encoder 2a.
(3). Make Vab1 in tune with encoder 3a.
(4). Make Vbc2 in tune with encoder 1b.
(5). Make Vca2 in tune with encoder 2b.
(6). Make Vab2 in tune with encoder 3b.



TRAINING COURSE SYLLABUS

for

SIGMA SYNCDRIVE MAINTENANCE TRAINING

$\alpha\beta\chi\delta$

COURSE AIM

The aim of the course is to provide the trainee with a working knowledge of Sigma Syncdrive system control concepts, hardware and software architectures, maintenance, fault diagnostic facilities and fault recovery procedures that are to be applied by the first line maintainer.

Where possible every opportunity is taken during the course to re-enforce the theory with comprehensive practical hands on exercises using Sigma Syncdrive equipment.

COURSE DURATION

The duration of the Sigma Syncdrive Maintenance Training course is 4 days.

COURSE PRE-REQUISITES

The trainee must be familiar with general electrical theory and basic safety precautions associated with working on electrical drive control systems. The trainee should be conversant with general drive theory.

COURSE CONTENT

The content of the Sigma Syncdrive Maintenance training course is summarized as follows.

1. Course Introduction – Day 1

2. Syncdrive System Overview – Day 1

- Description of the overall Syncdrive system.
- Overview of the instruction manual and associated documentation.
- Overview of Alstom circuit diagrams.

3. Syncdrive Operation – Day 1

- Local / remote operating modes and mode selection.
- Customer operator station controls.
- Description of HMI screen navigation and monitoring / control functions.
- Local / remote starting and stopping of the Syncdrive in normal and emergency situations.
- Dual and single channel mode of operation.
- Syncdrive start up procedure.
- Syncdrive shutdown procedure.
- Boiler control interface.

4. Syncdrive System Description – Day 1

- Detailed description of the Syncdrive system which identifies major system components, cabinet layout and signal flow though the Syncdrive system.
- Detailed description of the cooling system.
- Reference to be made to overall layout diagrams and visits to equipment to re-enforce the above.

5. Syncdrive Hardware Description – Day 1 & 2

- During this section of the course a detailed reference is to be made as appropriate to contract diagrams and instruction book documentation to re-enforce the subjects below.
- Description of the function, diagnostic facilities, interconnections and replacement procedures of the major Sigma regulator hardware components, namely Sigma core board, customer I/O board, keypad, power supplies, type 'C' power interface board, power amplifier boards, I/O modules, encoder sensors etc.

- Description of the function, diagnostic facilities, interconnections and replacement procedures of the major power system components, namely pulse distribution boards, gate boards, gating power supply, power module assembly etc.

- Description of the function, diagnostic facilities, interconnections and replacement procedures of the Spang excitation system.

- Description of the function, pressure and flow settings, diagnostic facilities, electrical / pipe connections and replacement procedures of major cooling system components, namely conductivity analyzer, pumps, de-ionization tank etc.

- Description of the function and diagnostic facilities of the HV breaker and motorized output disconnect switches.

6. Syncdrive Software Description – Day 2

- Sigma software architecture.

- Basic description of the function of Sigma links, ladder program and firmware.

- Appreciation of signal flow in the application software.

- Navigation and use of P80-P (Pilot) programming software.

- Monitoring parameters using P80-P or the Sigma keypad.

- Reloading Sigma regulator application program / firmware using P80-P.

- Appreciation of HMI software.

- Reloading HMI application software.

7. Fault Finding and Recovery – Day 3 & 4

- Indication of trip and alarm conditions (local and remote) and obtaining trip and alarm fault codes from the HMI and Sigma keypad.

- Overview of Syncdrive fault finding procedure.

- Familiarization with instruction manual fault code tables.

- Description of each trip and alarm and possible causes.

- Replacement procedure practical exercises for the following Syncdrive system components.

    - Sigma Core board.
    - Customer I/O board.
    - I/O expansion modules.
    - Sigma Power Supply.
    - Gating Power Supply.
    - HMI system.
    - Gate boards.
    - Pulse distribution boards.
    - Power assembly and power assembly components
    - Spang excitation controller.
    - Cooling system components
    - Conductivity analyzer / sensor.
      etc

- Fault finding exercises. Faults will be introduced into a Syncdrive system and the fault finding procedure will be applied by the student using the instruction manual fault tables, trouble shooting guides and contract diagrams to identify the fault and apply the appropriate recovery procedure

8. Overdrive Trip Histories - Day 4

- Overview of the Overdrive trip history facilities.

- Manual upload of Syncdrive trip histories.

- Displaying trip histories using P80 View software.

- Appreciation of automatic trip history collection using Data Gatherer.

9. Routine Maintenance - Day 4

- Monthly routine maintenance.

- Annual routine maintenance.

Unit 1 'C' & 'D' Induced Draft Fan Variable Frequency Drive Test Plan
Revised 4/6/05

The Unit 1 'C' and 'D' ID fans still need to be load tested to determine the fan capability and operating performance at the maximum drive rating. In order to minimize risk to unit operation, from furnace pressure excursions, due to inadvertent fan or channel trips unit load should be reduced during fan testing. By combining these tests with the unit derates scheduled for safety valve testing we can minimize unit load reductions. There are bids for setting the Unit 1 Main steam safety valve and steam drum safety valve on April 10 with reduced unit load. During this time we plan on performing the following tests.

1. With the generator operating between 860 - 890 MWg, automate all four ID fans and balance fan speed. Record drive operating parameters.

2. Take the 'D' ID fan to manual and slowly raise the fan speed until the current limit (472 amperes per channel), or fan speed limit (954 rpm) is reached. Record fan speed, dc bus voltage, exciter current and transformer current for all four fans. Record cooling water temperature, torque, motor horsepower, dc bus voltage and current, and motor current on both the "C' and 'D' ID fans. Measure and record control system operating parameters. Hold for three hours.

3. Slowly lower the fan speed on the 'D' ID fan until four ID fans are balanced.

4. Remove the 1D1 channel from service and record fan operating data.

5. Place the 1D1 channel back in service and balance all four ID Fans.

6. Remove the 1D2 channel from service and record fan operating data.

7. Place the 1D2 channel back in service and balance all four ID Fans

8. Take the 'C' ID fan to manual and slowly raise the fan speed until the current limit (472 amperes per channel), or fan speed limit (954 rpm) is reached. Record fan speed, dc bus voltage, exciter current and transformer current for all four fans. Record cooling water temperature, torque, motor horsepower, dc bus voltage and current, and motor current on both the "C' and 'D' ID fans. Measure and record control system operating parameters. Hold for three hours.

9. Slowly lower the fan speed on the 'C' ID fan until four ID fans are balanced.

10. Remove the 1C1 channel from service and record fan operating data.

11. Place the 1C1 channel back in service and balance all four ID Fans.

12. Remove the 1C2 channel from service and record fan operating data.

13. Place the 1C2 channel back in service and balance all four ID Fans

If we do find problems with the new fan controllers it may be necessary to reload a new control program. Reloading the program will require removing one channel (link) from service at a time and then retesting.

Unit 1 'C' & 'D' Induced Draft Fan Variable Frequency Drive Test Plan

1. With the generator operating at 875 MWg, automate all four ID fans and balance fan speed. Record drive operating parameters.

2. Maintain balanced operation for one hour, while recording operating data.

3. Take the 'D' ID fan to manual and slowly raise the fan speed until the current limit (472 amperes per channel), or fan speed limit (954 rpm) is reached. Record fan speed, dc bus voltage, exciter current and transformer current for all four fans. Record cooling water temperature, torque, motor horsepower, dc bus voltage and current and motor current on both the "C' and 'D' ID fans. Measure and record control system operating parameters. Hold for three hours.

4. Slowly lower the fan speed on the 'D' ID fan until four ID fans are balanced. Hold for 15 minutes and measure operating data.

5. Lower 'D' fan speed, 50 rpm at a time, until the 'D' fan begins to back out of the header. Record operating data at each speed point.

6. Raise the 'D' fan speed until the four ID Fans are balanced and automate the fan control system. Hold for 15 minutes and measure the drive operating parameters.

7. Take the 'C' ID fan to manual and slowly raise the fan speed until the current limit (472 amperes per channel) or fan speed limit (954 rpm) is reached. Record fan speed, dc bus voltage, exciter current and transformer current for all four fans. Record cooling water temperature, torque, motor horsepower, dc bus voltage and current and motor current on both the "C' and 'D' ID fans. Measure and record control system operating parameters. Hold for three hours.

8. Slowly lower the fan speed on the 'C' ID fan until four ID fans are balanced. Hold for 15 minutes and measure operating data.

9. Lower 'C' fan speed, 50 rpm at a time, until the 'C' fan begins to back out of the header. Record operating data at each speed point.

10. Raise the 'C' fan speed until the four ID Fans are balanced and automate the induced draft fan control system. Hold for 15 minutes and measure the drive operating parameters.

The Unit load is being limited, during this test, to provide some operating margin and to limit pressure swings if an ID fan trips. Because we are just measuring operating parameters we do not expect any fans to trip but we will be operating with old drive systems on the 'A' and 'B' ID fans. If we do find problems with the new fan controllers it may be necessary to reload a new control program. Reloading the program will require removing one channel (link) from service at a time and then retesting.

EQUIPMENT BID AND RECORD

USE 24HR TIME FORMAT

Requested by Jon P. Christensen Div. IPSC Sec. IGS Submitted by _____ Operator _____ Time _____ Date

☐ Out of Service
☐ Clearance TO Jon P. Christensen Responsible Party
☒ O.K.

Div. IPSC
Sec. IGS

EQUIPMENT REQUESTED: Unit 1 'C' &'D' Induced Draft Fans, Unit 1 Generator

NATURE OF WORK: Test capability of new variable frequency drives installed on the fans.

BID Time
FROM: Sunday 0700 MDST Time 4/10/05 Date **TO:** Sunday 1730 MDST Time 4/10/05 Date

WORK Time
FROM: Sunday 0730 MDST Time 4/10/05 Date **TO:** Sunday 1700 MDST Time 4/10/05 Date

MST=Mountain Standard MDST=Mountain Daylight PST=Pacific Standard PDST=Pacific Daylight

PREPARATION REQUIRED: Coordinate load limits with main steam and steam drum safety valve work. Limit the load on the Unit 1 Generator to less than 890 MWg. The main steam work, with a load limit of 890 MWg, is scheduled from 9:00 am until 12:00 noon. The steam drum safety valve work with a load limit of 860 MWg, is scheduled from 12:00 noon until 5:00 pm.

BID APPROVED:

OPS Supv. _____ Time _____ Date _____ Removed by _____ Time _____ Date _____

Supt. _____ Time _____ Date _____ Issued to _____ Time _____ Date _____

Dispatcher _____ Time _____ Date _____ Returned by _____ Time _____ Date _____

EQUIPMENT NORMAL: Time _____ Date _____ By Operator _____ Supv. _____

Remarks: _____

IP7015395

EQUIPMENT BID AND RECORD

USE 24HR TIME FORMAT

Requested by Jon P. Christensen Div. IPSC Sec. IGS Submitted by _____ (Operator) _____ (Time) _____ (Date)

☐ Out of Service
☐ Clearance TO Jon P. Christensen (Responsible Party) Div. IPSC Sec. IGS
☒ O.K.

EQUIPMENT REQUESTED: Unit 1 'C' &'D' Induced Draft Fans, Unit 1 Generator

NATURE OF WORK: Test capability of new variable frequency drives installed on the fans.

BID Time
FROM: Monday 0700 MDST (Time) 4/4/05 (Date) **TO:** Monday 1800 MDST (Time) 4/4/05 (Date)

WORK Time
FROM: Monday 0730 MDST (Time) 4/4/05 (Date) **TO:** Monday 1730 MDST (Time) 4/4/05 (Date)

MST=Mountain Standard MDST=Mountain Daylight PST=Pacific Standard PDST=Pacific Daylight

PREPARATION REQUIRED: Limit the load on the Unit 1 Generator to 875 MWg

BID APPROVED:

OPS Supv. _____ Time _____ Date _____ Removed by _____ Time _____ Date _____

Supt. _____ Time _____ Date _____ Issued to _____ Time _____ Date _____

Dispatcher _____ Time _____ Date _____ Returned by _____ Time _____ Date _____

EQUIPMENT NORMAL: Time _____ Date _____ By _____ (Operator) _____ (Supv.)

Remarks: _____

IP7015396

Unit 1 ID Fan Start-up Testing
March to April 2005

March 28 5:30 pm until March 29 6:30 am

Flow testing - operate the 'C' and 'D' ID Fans from the control room to provide maximum possible draft. Perform exciter phase checks, transfers between dual and single channel operation, trip test, speed change overshoot and record and measure operating parameters.

March 30 through April 1

Run 'C' and 'D' fans on turning gear or at low speed to provide boiler draft. Fans should be running as much possible, but may be turned off to reduce draft in boiler or scrubbers.

During the day, we will be monitoring fan performance and conducting training for the electricians. As part of the training, we will shutdown individual channels (links) and calibrate replacement circuits boards and install them in the channels. This procedure will verify our spare parts and give the electricians experience in troubleshooting and repair. During the night, the fans should be run to gain operating time.

April 2 and April 3

As the unit is brought on line, use the 'C' and 'D' fans first. During this period, we will measure and record drive operating parameters. When the unit load is stable (above 400 MW) and all four ID fans are in service we will perform trip tests on individual channels (links) by isolating the exciter feeds and tripping input circuit breakers. We will also test speed response and overshoot by placing one fan in manual control and biasing the fan to the maximum possible load. During this time we will also measure and record drive operating parameters.

April 4

Performance testing of the ID fans. **Unit load must be initially limited to 875 MW to limit pressure swings in boiler if a fan trips.** The bid for this work should allow for operating the unit between 875 MW and 950 MW. Part of this test is to determine the maximum ID fan capacity so we may need to raise unit load, above 875 MW as the testing progresses.. This work should be bid for 7:30 am until 5:30 pm.

By placing one or two ID fans in manual control and biasing the fans we will slowly raise one of the fans operating speed until the fan is current or speed limited. The new drives are designed to limit fan speed to 954 rpm and will trip at 975 rpm. The drives also have a current limit of 472 amperes per channel, in dual channel operation, and 538 amperes, in single channel operation.

As we raise fan speed we will measure and record drive operating parameters and change speed to measure system speed response.

UNIT 1 SPRING 2005 OUTAGE
ID FAN 'C & D' DRIVE REPLACEMENT SCHEDULE
December 22, 2004

1. Training

   a. Class - Pittsburgh January 10 through 14, 2005
      i. Course Outline (preliminary)
         (1) Documentation Overview
         (2) Initial troubleshooting/alarm review
         (3) Controller (Sigma, Spang, Red Lion) setup and programming
         (4) Hands on troubleshooting
      ii. Pre-course work
         (1) Review instruction books and information on the N drive

   b. Commissioning March 9 through 20, 2005
      i. Alstom proposal - IPSC labor /Alstom labor

   c. Controller replacement /setup March 21 through 25, 2005
      i. One electrician per channel (link) per day - 10 electricians total

   d. Future

2. Unit 2 Outage work - Unit 2 'D' Regulator Cabinet modifications
   a. Pre-outage
      i. Before February 11 verify labels on all cables
   b. February 11, 2005
      i. Disconnect cables, in the regulator cubicles, and lay them in cable tray. Two shifts of 2 electricians (one per channel) 12 hour days
   c. February 12, through February 20, 2005
      i. Assist Alstom with rewiring and commissioning (Alstom 16 hour days)

3. Unit 1 Outage work - Unit 1 'C & D' Drive installations
   a. Pre-outage
      i. Verify labels on all cables
   b. February 14 through 18, 2005
      i. Assist with encoder installations
   c. March 4, though March 9, 2005
      i. Complete all inspections on transformers, motors. Assist electrical contractor with drive installation and wiring.
   d. March 10, through 20, 2005
      i. IPSC or Alstom commissions the drives

4. Other topics

IGS02-07 Induced Draft Fan Variable Speed Drives
Unit 2 April 2006 - A, B & C Drive Installations

Summary

Modifications

Cooling water pump chop over modifications to prevent nuisance trips on conductivity - check conductivity levels before switching and block conductivity trips immediately after a switch

Added alarm to indicate disconnect switch key switch in the incorrect position for operation

Changed taps on isolation transformers

Changed settings on high input voltage alarms

Outstanding issues

Drive current limit 490 amperes vs 472 amperes

Communications/Data logging

Direct trips which do not provide alarms (conductivity)

Preparations for next years outage

Lessons learned /improvements needed

Unit 2 'D' ID Fan Variable Frequency Drive Start-Up

Thursday Feb 17, 2005

Test I/O circuits including remote control and indication from Control Room

Friday Feb 18, 2005

Complete I/O verification
Apply 6.9 KV power- verify power circuits
Rotate fan turning gear speed to 300 rpm
Test reverse rotation protection circuits
Test encoder less start capability

Saturday Feb 19, 2005

Complete operational testing at maximum available fan speed

Unit 2 ID Fan Readings

2A2 Large Motor Bus
Auxiliary Electric Panel Readings
6600 Volts, 13 MW, 15 MVAR

1A1 Drive
- Local indication
  - 2800 VDC
  - 500 A DC
  - 760 rpm
  - 0 A Field current
- Control Room meters (xfmr secondary - calculated)
  - 5 kV AC
  - 325A AC
- Switchgear meters (xfmr primary)
  - 6650 V
  - 245 A

1A2 Drive
- Local indication
  - 2800 VDC
  - 480 A DC
  - 740 rpm
  - 42 A Field current
- Control Room meters (xfmr secondary - calculated)
  - 5+ kV AC
  - 375A AC
- Switchgear meters (xfmr primary)
  - 6650 V
  - 235 A

1B1 Drive
- Local indication
  - 2750 VDC
  - 520 A DC
  - 740 rpm
  - 0 A Field current
- Control Room meters (xfmr secondary - calculated)
  - 4.5 kV AC
  - 350A AC
- Switchgear meters (xfmr primary)
  - 6650 V
  - 255 A

1B2 Drive
- Local indication
  - 3000 VDC
  - 540 A DC
  - 740 rpm
  - 47 A Field current
- Control Room meters (xfmr secondary - calculated)
  - 4.8 kV AC
  - 340 A AC
- Switchgear meters (xfmr primary)
  - 6650 V
  - 260 A

2B2 Large Motor Bus
Auxiliary Electric Panel Readings
6600 Volts, 15 MW, 15.4 MVAR

1C1 Drive
- Local indication
  - 3000 VDC
  - 455 A DC
  - 730 rpm
  - 0 A Field current
- Control Room meters (xfmr secondary - calculated)
  - 5 kV AC
  - 320A AC
- Switchgear meters (xfmr primary)
  - 6590 V
  - 225 A

1C2 Drive
- Local indication
  - 2900 VDC
  - 470 A DC
  - 750 rpm
  - 41 A Field current
- Control Room meters (xfmr secondary - calculated)
  - 5 kV AC
  - 300A AC
- Switchgear meters (xfmr primary)
  - 6590 V
  - 225 A

1D1 Drive
- Local indication
  - 2800 VDC
  - 450 A DC
  - 730 rpm
  - 0 A Field current
- Control Room meters (xfmr secondary - calculated)
  - 4.8 kV AC
  - 340A AC
- Switchgear meters (xfmr primary)
  - 6590 V
  - 215 A

1D2 Drive
- Local indication
  - 2800 VDC
  - 450 A DC
  - 740 rpm
  - 39 A Field current
- Control Room meters (xfmr secondary - calculated)
  - 4.8 kV AC
  - 330A AC
- Switchgear meters (xfmr primary)
  - 6590 V
  - 210 A

TRANSMITTAL

IPP

INTERMOUNTAIN POWER SERVICE CORPORATION

ADDRESS: 850 W. Brush Wellman Rd., Delta, UT 84624
CONFIRMATION: (435) 864-4414 Ext. 6577
FACSIMILE: (435) 864-6670

TO

Company: Teco - Westinghouse Motor Co.
Attention: Linda Crislip
Facsimile: 512-218-7398

FROM

Name: Jon P. Christensen
Department: Technical Services
Phone: 435-864-6481
Date: December 21, 2010

Pages to follow: 0

The Intermountain Power Project purchased eight 7415/4596 HP, 3876/3876 volt synchronous motors from Westinghouse in 1983. The motors were purchased as part of a package with Westinghouse adjustable frequency drives. The motors were serial numbers 1729AA/AB.

We are in the process of replacing the adjustable frequency drives and need to provide the drive manufacturers with the motor design parameters such as the subtransient reactance.

Please review the motor design information and provide us with the machine engineering data. This request has been discussed with Dan Wolf.

If you need any additional information, please contact me by phone or e-mail at jon-c@ipsc.com. Thanks

Approval

Date/Time Sent

IP7015406

To:	Mr. George W. Cross President and Chief Operating Officer Intermountain Power Service Corporation 850 West Brush Wellman Road Delta, UT 84624-9546 Attention: Jon Christensen, Contract Administrator	From:	Stephen P. Klein Project Manager
cc:		Tel: Fax: Email:	412 967-7168 412 967-7668 Steve.klein@tde.alstom.com
Your Ref: Our Ref:	Contract No.: 04-45605 GD70107	Date: No. of Pgs.:	November 25, 2003 1 of 2
Project:	Unit No. 1 ID Fans Adjustable Speed Drive	Comm. No:	AP-IP-L-008
Subject:	Order Acceptance		

Dear Jon:

Subsequent to Alstom's review of Contract No. 04-45605 and joint discussions to date relative to comments submitted in Alstom's letter of November 18, 2003, AP-IP-L-006, Alstom hereby submits the following items.

1. Three (3) original Contract Agreements signed by Alstom

2. Change Order No. 1 to Contract No. 04-45605 implementing revisions agreed by Alstom and Intermountain Power – This change order should be transferred onto Intermountain Power letterhead and returned for acceptance signature by Alstom. An electronic version can be provided, if desired.

Additionally, the following issues remain to be resolved.

a. Specification 45605 Division F3, Section 24, Terminal Blocks: States stud-type terminal blocks are not Alstom's standard and the incremental cost for use of States terminal blocks instead of our standard has been quoted on 11/24/03. Include this item in change order #1 with the pricing previously submitted.

b. Specification 45606 Division F7, Section 8, Programming and Communications, Paragraph b., Hard-Wired Communication: The number of required I/O signals must be agreed.

c. Specification 45606 Division 7, Pages F7-21 through F7-25, Existing Hardware Control Signal List: To be discussed further and resolved following Jon Christensen's review of revised schematic drawings submitted on 11/19/03. Based on our discussions November 25, 2003 with John Bradley , Alstom is to submit an approval set of drawings for review. We are finished reviewing preliminary copies. The final control signal list will be based on our review of the official submittal drawings no the drawings submitted on 11/19/03.

Please advise if you have any comments or would like to discuss this letter further prior to forwarding it to John Larsen.

Sincerely,

Stephen P. Klein

From: <john.bradley@tde.alstom.com>
To: <jon-c@ipsc.com>
Date: 10/18/2003 10:46:57 AM
Subject: Cabling questions

John,

In reviewing the I/O for the upcoming drives I have the following questions.

Refer to 2CCE-K2128B (ID2 Cabling Diagram). Cable # 18 color R-BK currently lands on 5TB: C1721. From my understanding, this cable goes to the Modicon however this d/i is designated as going to the Switchgear (see Westinghouse Dwg 5065C890 sht C17).
Refer to 2CCE-K2128B (ID2 Cabling Diagram). Cable # 15 color BK & R currently lands on Incomig Cabinet B212 & B214. From my understanding, this cable goes to the Modicon however this d/i is designated as going to the Switchgear (see Westinghouse Dwg 5065C890 sht B2).
With respect to the Annunciator, do you have the capability of fitting new windows thereto. I ask this as some of the annunciations are no longer valid and I would like to change the engravings to be more descriptive.
What would you like the drive to do if it loses the speed reference from the control room?

Regards

jb

IPSC Drives

Jon,

Based on conversations with the Rockwell engineers, it sounds like we can provide you a solution for your 7415 H.P. ID Fan VFD project. Listed below are a few questions that the engineers have.

Questions:

1. Do you still want the capability of running on one drive?
   A. We can accommodate the full Horsepower (7415HP, 6 phase rating) by using two drives (approx. 3750HP each) but we need to know if you still want the capability of operating on one drive. If you still want this capability, we will need to size each drive at approx. 4500HP.

2. Do you want to use your existing 4378KVA Transformers?

3. If you want to use existing XFMRs we need the following information:
   A. Need complete data on both transformers(specifically the XFMR insulation)

4. How and where are you establishing your grounded Neutral?
   A. Are you establishing a ground at the secondary of each XFRM or at the output of each drive? Need to know this for our CSI type drive.

5. Exciter / Field Information:
   A. Voltage and Current rating of Field/Exciter
   B. Cut Sheets on Exciter, What Type of exciter – AC Brushless or DC Brush Type

The Rockwell drives we would propose are a CSI type technology. The Rockwell engineers indicated that LCI is an old drive technology and has many limitations versus the new CSI technology. Just a couple of the items they mentioned are:

1. Very high Harmonics, especially at lower speeds
2. Operating speed range very limited

The only reason I bring up the disadvantages of LCI technology is because there are drive manufactures that are still selling new drives with this technology.

If you would provide me with an answer to the above questions, I will pass these on to the engineers and they will provide me with a more detailed package description of what Rockwell would provide in their proposed solution.

Please give me a call if you have any questions.

Thanks
Brett Payne
Drives Specialist
Codale Electric Supply
801-975-5563

Preliminary Comments on ALSTOM drawings.

Drawing No. GD70107/2000-8100 1of 2

The INV/CONV door panel is only acceptable on this channel. Drive D delta channel. All others are to have hinged doors with lockable handles.

Submit details of the water connection. Cabinet height cannot exceed 92" as there are overhead obstructions at 94".

Verify the lifting angle matches the shipping splits.

NEMA 1 GASKETED construction

Provide a detail drawing of the bus connections for the high voltage power cable connections. Elevations incorrect see Westinghouse drawing and pictures.

Provide drawings of the contactor and verify ratings and load break

Provide sheet 3 of 3.

Is there a support channel under the cabinets? Show on side view.

Verify light color selection is in accordance with the contract. The indication light standard is Red – on or running, Green – off, White is alarm or trip, and Amber is start permissive. See marked light colors. Reference contract page F3-9. Verify indicating lights are LED type and large diameter.

Submit seismic information and mounting details, approved by a registered profession structural engineer

Provide cabinet layout drawings showing major components and terminal blocks.

Fill in title block

Drawing No. GD70107/2000-8100 2of 2

The INV/CONV cabinets shall be provided with hinged doors with lockable handle and electrical interlocks.

Comments the same as sheet 1 of 2 except for the first one.

Drawing No.2001-101

The transformers and reactors should be dashed, furnished by others.

Verify the rating of the reactors

Show output contactors

Show fully redundant exciter

Supply nameplate information

Correct motor information, the motor is 7415 HP at 954RPM at 63.6 Hz

What is the 627 equivalent amps? The drive rating?

The shaft encoder is not required, discuss.

Match drive components with syncdrive single line diagram in the bid proposal

Note 4 should be 6900 volt customer supply

Drawing. No. 2001- 002

Explain dashed line on supply and machine surge circuit. Supplied by ALSTOM

Correct ground resistor indication

The output of the drive goes to the contactor not the motor

For the cables to the VSD transformer and output contactor match labels on Drawing No. GD70107/2000-8100 i.e. U,V,W, and MT1,MT2,MT3

Explain the "Z" symbol around the cable conductors (shown on several drawings)

Drawing. No. 2001-003

Verify this is a typical drawing for each channel.

Submit reference drawings listed MN/H4294 and MA/H6225

Drawing No. 2001-004

Verify this is a typical drawing for each channel.

Explain redundancy, it looks like only 2 power modules with N-1. How is there redundancy?

Drawing No. 2001-005

Verify this is a typical drawing for each channel.
Explain interconnect redundancy, here it only indicates one power module

Drawing No. 2001-007
Verify this is a typical drawing for each channel.
Where is the analog monitor located?
What does the dark arrow mechanical interlock indicate?

Drawing No. 2001-007A
Verify this is a typical drawing for each channel.
Verify the speed reference is scaleable from 90 to 1050 RPM
All analogs should be 4-20 ma.
The contract requires 5 additional analog inputs, 10 additional digital inputs and 5 additional analog outputs in addition to those required by the existing drive. Please confirm they will be furnished.

Drawing No. 2001-008
Verify this is a typical drawing for each channel.
Provide a write up of operation and logic diagrams.
Discuss the rotor position sensors.

Drawing No. 2001-008A
Verify this is a typical drawing for each channel.

Drawing No. 2001-008B
Verify this is a typical drawing for each channel.

Drawing No. 2001-009
Verify this is a typical drawing for each channel.
The drawing shows exciter input fuses. Are they necessary? If so why?
The cross reference sheet 12A/B should be channel 2, and 12C/D should be channel 1.

Drawing No. 2001-010
Verify this is a typical drawing for each channel.
The UPS supply was 2KVA in the proposal, 4.3 KVA is not acceptable.
The 480 V feed to the cooling pumps will be for one pump, IPSC will supply a second feed for the second pump.
Verify the 100 amp breaker on the main of the 480V system. The exciter indicates 90 amps alone. Cross reference at E-15 should be 1038 &1039, verify.
At U-6 cross reference is 12, submit sheet 12.

Drawing No. 2001-011
Verify this is a typical drawing for each channel.
Cross reference at H – 8 is to sheet 12 submit sheet 12.

Verify heater indicating lights (Red) are being furnished.

Drawing No. 2001-012A
The delta channel is channel 2 and the Y channel is channel 1.
Added cable numbers to the drawing.
Cable 2CCEK2128B18 to the Modicon is missing the neutral and the 52 breaker contact.
The 480 V. terminal block should be in cabinet 1. Terminals 1,2 & 3 require a 4/0 AWG cable and 4,5 & 6 require a #2 AWG cable, all others require #12.
The 120 V. terminal block should be in cabinet 6. The terminals require a #12 AWG cable.
TB2 terminal 3&4 show heater contacts, when they close it will short out the 120 Volts.
TB3 should be in cabinet 1.
Where is ENC SUPPLY and ENC? Cable?

Drawing No. 2001-012B
The delta channel is channel 2 and the Y channel is channel 1.
Added cable numbers to the drawing.
The jumpers need to be verified.

Drawing No. 2001-101,102, 104,105 and 106 are all for the cooling system.
IPSC will furnish a second feed for the second cooling pump in each channel.
What is the customer connection to the heat exchanger?
The outside temperature should be 50° C.
Verify input is a 50-50 water-glycol mix.
Is this an open system, it has a drain, to where? The transformers are below this.

GENERAL COMMENTS

- ALSTOM to furnish a letter detailing training (Quote) with added time for generic LCI training. This was due 10/20/03.
- We discussed having a conference call every two weeks, would like to start these.
- ALSTOM to verify indicating lights are being furnished for the contactor. Submit drawings.

ALSTOM DRAWING REVIEW COMMENTS
APPROVAL DRAWINGS SUBMITTED 12/11/03

General comments

1. In the title bock change IPCS to IPSC.

2. On all drawings that show a SS shipping split, there are many that only show the SS on one side and the other side is to a terminal block. Show the SS on both ends of the cable.

3. Show all relay contacts.

4. Drawing Numbering System

Alstom Drawing Number	Unit Designation	Project Equipment	IPP Drawing #
2000-8100-01	Unit 2	2CCE-EXX-1D2	63.2203.1.05-240001
2000-8100-02	Unit 2	2CCE-EXX-1D1	63.2203.1.05-240002
GD70107\2001-RR1	Unit 2	2CCE-EXX-1D	63.2203.1.05-240003
GD70107\2001-001	Unit 2	2CCE-EXX-1D	63.2203.1.05-240004
GD70107\2001-002	Unit 2	2CCE-EXX-1D	63.2203.1.05-240005
GD70107\2001-003	Unit 2	2CCE-EXX-1D	63.2203.1.05-240006
GD70107\2001-004	Unit 2	2CCE-EXX-1D	63.2203.1.05-240007
GD70107\2001-005	Unit 2	2CCE-EXX-1D	63.2203.1.05-240008
GD70107\2001-006	Unit 2	2CCE-EXX-1D	63.2203.1.05-240009
GD70107\2001-007	Unit 2	2CCE-EXX-1D	63.2203.1.05-240010
GD70107\2001-007A	Unit 2	2CCE-EXX-1D	63.2203.1.05-240011
GD70107\2001-008	Unit 2	2CCE-EXX-1D	63.2203.1.05-240012
GD70107\2001-008A	Unit 2	2CCE-EXX-1D	63.2203.1.05-240013
GD70107\2001-008B	Unit 2	2CCE-EXX-1D	63.2203.1.05-240014
GD70107\2001-009	Unit 2	2CCE-EXX-1D	63.2203.1.05-240015
GD70107\2001-010	Unit 2	2CCE-EXX-1D	63.2203.1.05-240016
GD70107\2001-011	Unit 2	2CCE-EXX-1D	63.2203.1.05-240017
GD70107\2001-012A	Unit 2	2CCE-EXX-1D	63.2203.1.05-240018
GD70107\2001-012B	Unit 2	2CCE-EXX-1D	63.2203.1.05-240019
GD70107\2001-0012C	Unit 2	2CCE-EXX-1D	63.2203.1.05-240020
GD70107\2001-0012D	Unit 2	2CCE-EXX-1D	63.2203.1.05-240021
GD70107\2001-0013	Unit 2	2CCE-EXX-1D	63.2203.1.05-240022
GD70107\2001-101	Unit 2	2CCE-EXX-1D	63.2203.1.05-240023
GD70107\2001-102	Unit 2	2CCE-EXX-1D	63.2203.1.05-240024
GD70107\2001-103	Unit 2	2CCE-EXX-1D	63.2203.1.05-240025
GD70107\2001-104	Unit 2	2CCE-EXX-1D	63.2203.1.05-240026
GD70107\2001-105	Unit 2	2CCE-EXX-1D	63.2203.1.05-240027
GD70107\2001-106	Unit 2	2CCE-EXX-1D	63.2203.1.05-240028

GD70107\2001-107	Unit 2	2CCE-EXX-1D	63.2203.1.05-240029
QF0209r1	*not required*	*not required*	63.2203.1.05-900001*
C-13467 sheet 1 of 1	*not required*	*not required*	63.2203.1.05-900002*
NP-11198 sheet 1 of 2	*not required*	*not required*	63.2203.1.05-900003*
NP-11198 sheet 2 of 2	*not required*	*not required*	63.2203.1.05-900004*
CW-12561	*not required*	*not required*	63.2203.1.05-900005*

* The IPP drawing numbers for the motor operated switch assumes the switch drawings are generic for all eight drive assemblies. If separate drawings are being furnished for each drive assembly the numbers will be changed to reflect the correct unit number.

IPP numbering scheme

63.2203.1.AA-BCDDDD

63.2203.1	Alstom Contract 45605	
AA	drawings	.05
	reports	.06
	instruction books	.07
B	Unit 1, 2 or 9 (common equipment)	
C	equipment number	A drive is 1, B drive is 2, C drive is 3, D drive is 4
DDDD	sequential number for each vendor drawing number	

Drawing No. GD70107/2000-8100-01 and -02

1. Provide a detail drawing of the bus connections for the high voltage power cable connections. Verify electrical clearances are in accordance with ANSI standards, including any de-rating required for elevation. Provide detailed information on cable connection including bolt torques, bolting assembly and installation requirements. Submit details of the power cable connections.
2. Submit details of the anchor bolts including size and type of installation with a Structural PE stamp on the calculation and details. Seismic details shall be based on installation on the existing floors.
3. Provide cabinet layout drawings showing major components and terminal blocks.

Drawing No. GD70107/2001-RR1

1. See General comments

Drawing No GD70107/2001-001

1. Add terminal numbers on this drawing for all cabling, including DC Link Reactors, exciters and shaft encoders.

Drawing. GD70107/2001- 002

1. Show shipping splits (SS) in a consistent manner. At A10 it shows a SS and the other end of the cable on 008A-H13 also shows a SS. Show shipping splits on both ends of each cable.
2. At U10 add drawing number for disconnect switch.
3. The existing DC Link Reactor has a distribution class arrestor connected to the line terminal. This should be shown on this drawing.

Drawing. No GD70107/2001- 003

1. At P3 provide the reference drawing MN/H4294
2. The cross-reference at B9 and G9 are reversed for the 25 ribbon cables.
3. At V6 the cross-reference should be U11 not U1.

Drawing No. GD70107/2001- 004

1. The cross-reference at E2 and R2 are reversed for the 25 ribbon cables, See comment on sheet 2001–003.

Drawing No. GD70107/2001- 005

1. There should be a SS at E9 for the 24 VDC cable 1030.

Drawing No. GD70107/2001- 006

1. No exceptions noted.

Drawing No. GD70107/2001- 007

1. At R15, change the dashed outline to a solid line to indicate the resistors are furnished by Alstom.

Drawing No. GD70107/2001- 007A

1. Provide a write up of operation and logic diagrams.
2. All spare analog circuits are to be 4 – 20 mA.
3. At P11 add contact numbers to SOR both contacts.
4. At T11 the speed feedback should be 150-1100RPM.
5. At R3 the cable to exciter is shown as twisted and the other side is shown as shielded, what is correct?

Drawing No. GD70107/2001- 008

1. At P12 where is DIS used? Provide reference to switch drawings.

Drawing No. GD70107/2001- 008A

1. No exceptions noted.

Drawing No. GD70107/2001-008B

1. No exceptions noted.

Drawing No. GD70107/2001-009

1. At K12 the exciter cable is shown as shielded on other side it is twisted, what is correct?
2. At P6 the FCN top connect needs contact numbers. This complete contact has to be looked at.

Drawing No. GD70107/2001-010

1. At E3 add wire 1056 to TB2-8
2. At C15 TB2-1 should be 1037 wire # per other end, correct.
3. At C15 TB2-2 should be 1038 wire # per other end, correct.
4. At K7 wire # 1019D should cross-reference 11-F13 not 11-B13
5. At U6 wire # 1026 add TB3-21
6. At U6 wire # 1027 add TB2-22
7. At U9 wire number 1031 should go to 011-F2 not 011-B2.
   2001-011

Drawing No. GD70107/2001-011

1. At E5 the light should be A not G
2. At D14 the wiring of FCN has to be checked as well as TB's. see sheet 009 P5
3. At J15 add contact numbers to FCN, check wiring of FCN last contact.
4. At J15 relay BKTP shows 2 contacts (not numbered) on sheet 12A and 12C it shows both contacts in series. If in series need to show 4 contacts not 2.
5. At T2 terminal TB2-4 should be wire #1039

Drawing No. GD70107/2001-012A

General comments for the wiring drawings 12A, 12B, 12C and 12D

The circuit numbers do not have any hyphens or spaces to differentiate them from the drawing numbers. A typical circuit number would be 2CCEK2127B01. The drawing number associated with that circuit is 2CCE-K2127B.

Attached is a revised drawing for 12A showing the correct format.

1. TB2-1 should be wire # 1046
2. TB2-2 should be wire # 1047
3. TB2-4 should be wire # 1049A and cross-reference should be 011-T3
4. TB2-5 should be wire # 1017
5. TB2-6 should be wire #1019 and cross reference should be 010-B2 not N1
6. TB2-7 and 8 should NOT show a wire on sheet 12A it is only on sheet 12C
7. At L19 cross-reference should be 010-E5 not 010-C5.
8. TB2-11 and 12 each show a contact (2 in series) not that way on other end.
9. Contact on TB3-36 and 37 should be numbered.

Drawing No. GD70107/2001-012B

1. Correct the format to match 12A.

Drawing No. GD70107/2001-013

1. No exceptions noted.

Drawing No. GD70107/2001-101

1. Show all contacts on all relays

Drawing No. GD70107/2001-102

1. At N8 cross reference should be 101-M2 not M7
2. At N11 cross reference should be 101-N2 not N7
3. The OL is before the contactor, I have always seen it after the contactor i.e. between the contactor and motor. It will work but what do you want.
4. The OL is set at 1.5 amps, too low the FLA is 1.4 per this drawing and 2.5 per sheet 106. What is correct?

Drawing No. GD70107/2001-103

1. At L all cross-references letter 7 should be letter 2.
2. At M18 and M19 the last two wires should have a wire # 1030
3. At M4 wire #10311 should be 10318
4. At P2 cross-reference 011-B11 should be 011F11

Drawing No. GD70107/2001-104

1. TBP1-17 on the left side should be wire # 10311 per cross reference, yet the other side 10318 is correct per the cross reference.

Drawing No. GD70107/2001-105

1. At R12 the low point drain goes where? To the drip pan?

Drawing No. GD70107/2001-106

1. The motor data is different FLA 2.5 on sheet 104 it is 1.4.
2. At G14 install at lowest point, does it go to drip pan?
3. At B17 is the drain and is shows in the base at ground on the GA, how to you drain any water? Is there a valve? How can you drain it to a container since the drain is at floor level. Water will not run up hill.

Drawing No. CW-12561 and CW-12560

1. Add cross reference to Alstom drawings for 120 V.AC.
2. Drawing shows remote start and stop. What is this?

Drawing No.C-13467

1. Still shows a J bolt, this will not work.
2. Submit details of the anchor bolts including size and type of installation with a Structural PE stamp on the calculation and details.
3. Drawing shows 5 foot aisle not available
4. The remote control conduit, if used would have to be core drilled.
5. The enclosure has to be gasketed.

From: <john.bradley@tde.alstom.com>
To: <jon-c@ipsc.com>
Date: 10/27/2003 2:14:05 PM
Subject: Cooling Water System (with attachment)

Guess it would help to attach the "attachments."

(See attached file: Amot 2470 Thermostatic Valve.ZIP)
"Amot 2470 Thermostatic Valve.pdf"

---------- Forwarded by John BRADLEY/USPIT01/TDE/ALSTOM on 10/27/2003 04:09 PM ----------

John BRADLEY
10/27/2003 05:01 PM

To: jon-c@ipsc.com
cc: David SMITH/DCU/DRC/ICG/GECALSTHOM@GA

Subject: Cooling Water System

Jon,

Regarding the drive cooling system we intend on using an Amot 2470 Thermo Static control valve (see attachment). In order to know exaclty what to install though, we need to know the following about the glycol cooling water supply that will be provided to the drive.

What is the water pressure?
Is the glycol water pre-filtered i.e. can we be sure that there will be no particles that will interfere with the valve workings?

Regards

John b

CC: <david.smith@tde.alstom.com>

From: <john.bradley@tde.alstom.com>
To: <jon-c@ipsc.com>
Date: 10/27/2003 2:11:03 PM
Subject: Cooling Water System

Jon,

Regarding the drive cooling system we intend on using an Amot 2470 Thermo Static control valve (see attachment). In order to know exaclty what to install though, we need to know the following about the glycol cooling water supply that will be provided to the drive.

What is the water pressure?
Is the glycol water pre-filtered i.e. can we be sure that there will be no particles that will interfere with the valve workings?

Regards

John b

CC: <david.smith@tde.alstom.com>

From: <ivan.martorell@powerconv.alstom.com>
To: <JON-C@IPSC.COM>, <NATHAN-C@IPSC.COM>
Date: 1/4/2005 10:07:28 PM
Subject: CURRENT DRAWINGS, transmit 1

Jon
Here are the current schematics. There are some minor changes to the schematic. I will bring these changes with me in Febuary. I will have to send in 3 emails due to file size restrictions

Communication #: AP-IP-E-010

(See attached file: 2001-1.zip)

Ivan Martorell

CC: <beth.chiesa@powerconv.alstom.com>, <steve.klein@powerconv.alstom.com>, <john.bradley@powerconv.alstom.com>

From: <ivan.martorell@powerconv.alstom.com>
To: <JON-C@IPSC.COM>, <NATHAN-C@IPSC.COM>
Date: 1/4/2005 10:07:28 PM
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Communication #: AP-IP-E-010

(See attached file: 2001-1.zip)

Ivan Martorell

CC: <beth.chiesa@powerconv.alstom.com>, <steve.klein@powerconv.alstom.com>, <john.bradley@powerconv.alstom.com>

From: Jon Christensen
To: steve.klein@powerconv.alstom.com
Date: 7/28/2005 10:37:06 AM
Subject: Re: GD 70116 - Intermountain Power Unit No. 1 ID Fans Adjustable Speed Drives

The Unit 2 outage is scheduled for April 1 until May 1, 2006. In this outage, we will be replacing the drives for the 'A', 'B' and 'C' ID Fans. Based on past experience, the Electrical Contractor will require six days to remove the existing Westinghouse drives and install the new Alstom Drives. I would plan on your work beginning on April 7. All commissioning will need to be completed by April 28 to give Operations adequate time to bring the unit back on line by 7:00 am on May 1.

The Unit 1 outage is scheduled for March 31 until April 30, 2007. In this outage, we will be replacing the drives for the 'A' and 'B' ID Fans. The Electrical Contractor will require five days to remove the existing Westinghouse drives and install the new Alstom Drives. I would plan on your work beginning on April 5. All commissioning will need to be completed by April 27 to give Operations adequate time to bring the unit back on line by 7:00 am on April 30.

If you have any other questions please let me know. Thanks

>>> <steve.klein@powerconv.alstom.com> 7/27/2005 2:13:51 PM >>>
Jon,

We are looking at our long range scheduling of commissioning personnel. Could you please advise the current planned shutdown dates for the 2006 and 2007 new drive installation and commissioning efforts.

Thanks for your help.

CC: Crop, Nathan

From: <john.bradley@tde.alstom.com>
To: <jon-c@ipsc.com>
Date: 11/4/2003 9:27:14 AM
Subject: Fast Operating relays

Jon,

I have located the 110V DC relays that we were discussing yesterday. The are

Siemens
Potter & Brumfield
K10P-11D15-110

They have an input resistance of 11,150 ohms. I rekon that if we use a 2k resistor in series with the coil making it 13,150 ohms will give about 119V across the coil (assuming that your DC supply is 140V) when the drive has tripped. You may want to consider wiring the coil in directly around the breaker's trip coil such that when the breaker is about to trip the relay picks up but then also drops out upon the breaker being opened. We then need a second breaker 'a' auxiliary wired in series with one of the n/o relay contacts and brought over to its respective channel as a breaker status.

Regarding the trip circuit supervision (TCS) indication, I believe that the breaker trip coil is a substantially smaller impedance than the relay, and should therefore not really present a problem. If however there is a problem, is it possible to obtain another lamp with a higher "turn-on" current rating? If the LED will illuminate due to the auxilliary relay even if the breaker trip circuit is unhealthy, it may be worth your while (if possible) putting in a higher pick up current LED. Thus if the breaker trip circuit fails total impedance will rise and limit the current to a value less than the pickup value of the lamp. The indication should go out. I thnk the greater concern is to be sure that the new realy does not pick up through the TCS indication.

Would you like me to send the two that I have to you? If so I will get them off to you on Wednesday upon confirmation that you want them.

Regards

jb

From: <steve.klein@tde.alstom.com>
To: <jon-c@ipsc.com>, <roger.grace@tde.alstom.com>, <david.smith@tde.alstom.com>, <john.bradley@tde.alstom.com>, <ivan.martorell@tde.alstom.com>
Date: 10/20/2003 11:42:32 AM
Subject: GD70107 - Intermountain Power Adjustable Speed Drive Project kick-offmeeting minutes

Gentlemen,

Attached please find minutes from our meeting of Wednesday October 15, 2003.

(See attached file: GD70107 Meeting at IPSC 101503.ZIP)
"GD70107 Meeting at IPSC 101503.doc"

Best Regards,

Steve Klein

Alstom Power Conversion Inc.

610 Epsilon Drive

Pittsburgh, PA 15238

Phone: 412-967-7168

Fax: 412-967-9326

CC: <ron.dorrian@tde.alstom.com>, <william.oleyar@tde.alstom.com>, <gary.smith@tde.alstom.com>

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MEETING REPORT

Project:	GD70107 – Intermountain Power Adj Speed Drive	Date of Meeting:	10/15/03
Venue:	Delta, Utah	Date of Issue:	10/18/03
Subject:	Project Kick-off meeting	No. of Pgs.:	1 of 4
Author:	S. P. Klein	Ref:	

Present:

John Benz, Sargent & Lundy

Jon Christensen, IPSC

Roger Grace, ALSTOM

Dave Smith, ALSTOM

John Bradley, ALSTOM

Ivan Martorell, ALSTOM

Steve Klein, ALSTOM

Copies:

R. Dorrian, ALSTOM

B. Oleyar, ALSTOM

G. Smith, ALSTOM

Subject: Minutes of Meeting

ACTION

- Jon Christensen of Intermountain Power (IPSC) advised site work schedule:
  - IPSC will disconnect existing drives morning of 2/28/04
  - IPSC contractor will disassemble & remove existing drive and install new ALSTOM drive – 2/29 – 3/03/04
  - IPSC will connect/cable ALSTOM drive immediately following installation
- The main focus of the project is reliability improvement and to address lack of availability of maintenance, parts availability and

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610 Epsilon Drive
Pittsburgh, PA 15238-2880 USA
Tel.: +1 (412) 967 0765
Fax: +1 (412) 967 7660
www.alstom.com

ACTION

problems with nuisance trips

- John Christensen identified IPSC personnel involved in the project

- Pam Bahr, Electrical Engineer; Kevin Miller, Maintenance Planner; Bob Wright, Electrical Supervisor for electricians; John Larsen, Purchasing agent and Brett Kent, mechanical engineer

- IPSC requested a letter advising 20 years of support, as promised — G. Smith
- Specification 45606, Part F was reviewed. The specification was marked-up with applicable comments and changes to be incorporated in a revised version by IPSC. Steve Klein is in possession of ALSTOM's marked-up copy. The following issues/actions were raised, additional to the simple spec mark-ups.
  - A letter is to be issued by ALSTOM following installation confirming provision & installation in accordance with the specification and identifying the start of the warranty period. — S. Klein
  - ALSTOM will quote a SIGMA training class for prior to testing. This is in addition to the training included in the proposal. — S. Klein
  - Start-up spares identified in section 2.1 & 2.2 of proposal shall be delivered with the drive
  - Schedule shall be updated on 1st of each month. An initial project schedule was distributed by ALSTOM. IPSC requested interim conference calls be held. — S. Klein
  - Autocad 2002 format is acceptable to IPSC for drawing transmittal. Submittal requirements defined in specification.
  - Week of 11/3/03 tentatively set for drawing review meeting. ALSTOM to confirm by 10/22/03. — S. Klein
  - Cooling water supply requirement to be reviewed by ALSTOM relative to 50/50 glycol solution. — D. Smith
  - IPSC provided additional plant details to John Bradley, including operating procedures, detailed floor plan, schematics/wiring diagrams, drive Instruction Books (IBs).
  - 10 day notice is required prior to start of test & shipment. — S. Klein
  - MSDS to be provided for mixed resin bed, any touch-up paint, thyristor grease and any other similar chemicals. — S. Klein

	ACTION
- Cabinet shall be painted ANSI 61 gray and touch-up paint shall be supplied.	
- IPSC drawing numbers must appear on ALSTOM drawings and IPSC will advise ID numbers for certain components at drawing review meeting.	
- Weidmuller crimp tool cut sheets shall be provided, 1 tool 10/12 ga. and 1 tool 14 ga. and higher.	S. Klein
- Extra ferrules and 20% extra terminal blocks shall be supplied.	
- Ribbon cables are to be labeled with sources on each end.	Martorell/ Bradley
- States TBs are preferred by IPSC. ALSTOM to confirm size can be accommodated and if so, quote adder for their use.	Martorell/ Klein
- Storage/Off-loading/Installation-Startup guidelines are to be provided 30 days prior to delivery.	ALSTOM
- Final IBs are required 30 days after startup. Draft copy to be provided 30 days before shipment.	ALSTOM
- A release is required from IPSC for shipment.	
- IPSC will send representative(s) to witness system testing at their expense. It is IPSC's position that expenses for witnessing of re-testing, performed at a later date due to ALSTOM problems at the original testing, should be to ALSTOM's account.	
- ALSTOM to submit specific questions for motor manufacturer re: up-rating beyond current scope.	D. Smith
- ALSTOM will quote take-out price for Torsional Analysis.	G. Smith/ Klein
- Spec. section F7-8, Programming & Communication will be rewritten by ALSTOM for inclusion in the revised specification.	D. Smith
- Harmonic study was done based upon 32KA. A correction factor may be applied to field test results if less than 32KA at time of test.	
- Door meters are not needed for analog signals.	
- I/O schedule to be submitted by ALSTOM by 10/24/03.	J. Bradley
- ALSTOM proposed IPSC consider adding encoders to facilitate	

ACTION

start-up from non-moving fan condition. Jon Christensen will consider.

- ALSTOM to submit response to $50/KVAR penalty based upon power factor evaluation. — G. Smith/D. Smith
- ALSTOM to confirm type of door lights (if any) to be used. — S. Klein

- Existing equipment was inspected and required measurements taken.

Induced Draft Fan Variable Frequency Drive Replacement Project Turnover Project IGS02-07

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m. Alstom Drawing Exciter Power Circuits
n. Alstom Drawing Auxiliary Power Supplies
o. Alstom Drawing Low Voltage Logic
p. Alstom Drawing Customer Connections – Delta Channel
q. Alstom Drawing Customer Connections – Delta Channel
r. Alstom Drawing Customer Connections – Wye Channel
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t. Alstom Drawing General Notes and Symbol Legend
u. Alstom Drawing Cooling System PLC
v. Alstom Drawing Cooling System Pumps
w. Alstom Drawing Cooling System Door Mounted Devices
x. Alstom Drawing Cooling System Terminal Block Details
y.
z. Alstom Drawing Inverter/Converter System P&ID
aa. Alstom Drawing Cooling System Cabinet P&ID

IV. Exciter Operation

a. Spang 853 DSP 90A unit training handouts

V. Commissioning Instructions

a. Commissioning Instructions for Intermountain Power Project ID Fan Syncdrive

VI. SIGMA Controller

a. CSP Technical Manual CSP.TM Issue C
b. SIGMA Controller Technical Manual SIGMA.TM Issue G

VII. Induced Draft System Operating Procedure – System Code (CCE)

VIII. System Description Induced Draft

From: <john.bradley@tde.alstom.com>
To: <jon-c@ipsc.com>
Date: 10/21/2003 1:36:26 PM
Subject: ID Fan I/O Schedule

Jon,

Attached, please find the I/O schedule that the drives will be designed to. Please note that I have not included any internal I/O (PSU Failure etc) as this only affects the external i/o.

Regards

John

(See attached file: IPP IO Spec.ZIP)
"IPP IO Spec.xls"

CC: <gary.smith@tde.alstom.com>, <steve.klein@tde.alstom.com>

Induced Draft Fan Variable Frequency Drive Operation Concerns

1. Channel Trips during Essential Services (120 volt UPS) Inverter Transfer

We have two separate essential service (120 volt AC) systems for the eight induced draft fan channels. There are two channels for each fan. The normal source is provided by inverters which convert the direct current from either battery chargers or batteries. A conditioned alternating current supply provides an alternate source of power. These systems are identified as Essential Services #1 and #2.

The essential service systems are designed to provide a make before break or "bumpless" transfer to the alternate source. Under worst case conditions the power is disrupted for a half cycle.

The voltage supplied to the load, from each system, is monitored by a high speed fault recorder. We do not monitor the voltage output of the inverter or the alternate source voltage. The essential services controls monitor the synchronism between the normal source provided by the inverter and the alternate source. Under normal conditions In addition, we monitor the out of synch contact in each system.

On Friday, March 16, 2007 Essential Services Inverter 1 failed and transfered to the alternate source. The first alarm from the fault recorder was an out of synch alarm for Essential Services #1. This alarm, as shown on the PDF file labeled 32.343923 calc, indicates this occurred at 01:13:32.343923. The voltage waveforms are shown for both systems, Inverter #1 shows a more distorted waveform than Inverter #2 but the voltages appear to be acceptable. Seven cycles later Inverter #1 voltage dips to 78.40 volts rms. During this time the harmonics on Inverter #1 are significantly higher than on Inverter #2.

At 01:13:33.323090 the Inverter #1 out of synch alarm clears. About 162 milliseconds later the voltage dips to 79.11 volts. The out synch alarms returns 14 milliseconds later. The out of synch alarm returns 176 milliseconds later. It clears after 152 milliseconds. During this time the voltage harmonic levels are oscillating.

The last record shows the Inverter#1 out of synch alarm clearing, coming in alarm, clearing and coming back into alarm. During this time the voltage harmonics are increasing and oscillating. The voltage dips to 66.95 rms. Thirty milliseconds after the voltage dip the Unit 2 Turbine -Generator Unit Trip Relay (UTR) operates tripping the generator.

The only alarms received from the sequence of events recorders during this time show the 1A1, 1B1, 1C1 and 1D1 induced draft fan channels tripping. When these channels tripped 1B1 and 1C1 were operating as the master channels. All of these channels are supplied from Essential Service #1. Essential Services #2 supplies the 1A2, 1B2, 1C2 and 1D2 channels.

The HMI history indicated

T R A N S M I T T A L

IPP

INTERMOUNTAIN POWER SERVICE CORPORATION

ADDRESS: 850 W. Brush Wellman Rd., Delta, UT 84624
CONFIRMATION: (435) 864-4414 Ext. 6577
FACSIMILE: (435) 864-6670

TO

Company: Alstom Power Conversion, Inc
Attention: Steve Klein
Facsimile: 412-967-7660

FROM

Name: Jon Christensen
Department: Technical Services
Phone: 435-864-6481
Date: December 21, 2010

Pages to follow: 1

Comments: The instruction book cover and spline layout, submitted, on Dec 23, 2003 are approved as noted.

On the cover, delete "Volume 1". Volume designations are only required for multiple volumes.

On the spline, "INTERMOUNTAIN POWER PROJECT" should be on three lines with one word on each line. This is similar to "INTERMOUNTAIN GENERATING STATION".

I have attached a marked up copy of your submittal. If you have any questions or comments please let me know. Thanks

_____
Approval

_____
Date/Time Sent

IP7015438

ALSTOM

Commissioning Schedule for IPP Dual Channel ID Fans (Unit 1C & 1D)

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
MARCH 06, 2005	**MARCH 07, 2005** JBD Travel to site	**MARCH 08, 2005** - Installation Inspection - Begin Shipping Split re-connections	**MARCH 09, 2005** - Complete Shipping Split connections. - Start filling water cooling systems.	**MARCH 10, 2005** - Temporary power to cooling pumps. Purge systems of air. - Organize test areas, equipment, docs, etc. MZ Travel to site	**MARCH 11, 2005** - Begin Low Voltage Power-up Checks. - Begin I/O checks - Run water cooling systems.	**MARCH 12, 2005** - Continue I/O checks - Test ACCB trip circuits. - Check/adjust water cooling flows. - Start pulse checks on D Fan
MARCH 13, 2005 - Complete I/O checks. - Complete Pulse tests on D Fan. - Start Pulse checks on C Fan. - H/W Overcurrent trip tests. - Field Exciter Tests	**MARCH 14, 2005** - Motor disconnect switches tested. - Complete pulse checks. - Diagnostics tests as per commissioning inst. - Start HV tests on D	**MARCH 15, 2005** - Continue HV Tests for D Fan - Open Circuit Tests - Short Circuit Tests	**MARCH 16, 2005** - Complete Fan D HV Tests. - Move test equipment to Fan C Drives. - Start HV Tests for Fan C Drives.	**MARCH 17, 2005** - Continue HV Tests for Fan C drives. - Open Circuit Tests - Short Circuit Tests	**MARCH 18, 2005** .- Complete HV Tests for Fan C drives.	**MARCH 19, 2005** - Check readiness of C and D motors for preliminary rotations. - Prepare for preliminary rotation tests
MARCH 20, 2005 - Begin Single Channel No-Load rotation tests. - Fan D encoder alignment CH2 - Fan D encoder alignment CH1 .	**MARCH 21, 2005** - Single Channel No-Load tests continue. - Fan C encoder alignment CH2 - Fan C encoder alignment CH1 .	**MARCH 22, 2005** - Single Channel No-Load tests continue. - Fan D Exciter phase rotation checks. - Fan C Exciter phase rotation checks. **REQUIRES 300 RPM**	**MARCH 23, 2005** - Single Channel No-Load tests continue. - Fan D Speed Regulator Control - Fan C Speed Regulator Control checks. **REQUIRES 300 RPM**	**MARCH 24, 2005** - Single Channel No-Load tests continue. - Fan D V/F control checks. - Fan C V/F control checks. **REQUIRES 300 RPM**	**MARCH 25, 2005** - Dual Channel No-Load tests. - Stop/Start tests Fan D - Operational & Stability checks Fan D - Master/Slave switch-over tests – Fan D.. **REQUIRES 300 RPM**	**MARCH 26, 2005** - Dual Channel No-Load tests continue. - Stop/Start tests Fan C - Operational & Stability checks Fan C - Master/Slave switch-over tests – Fan C **REQUIRES 300 RPM**
MARCH 27, 2005 - Single Channel Load Tests - Repeat V/F Control Tests with load on all four channels. **REQUIRES FULL LOAD**	**MARCH 28, 2005** - Dual Channel Full Load Tests - Full load current checks. Perform on both fans. **REQUIRES FULL LOAD**	**MARCH 29, 2005** - Dual Channel Full Load Tests - Beta and recovery time checks., Estop, master slave switchover.. Perform on both fans. **REQUIRES FULL LOAD**	**MARCH 30, 2005** - Monitor performance of drives. - Provide informal training for customer	**MARCH 31, 2005** - Monitor performance of drives. - Provide informal training for customer.	**APRIL 1, 2005** - Monitor performance of drives. - Provide informal training for customer.	**APRIL 2, 2005** - Monitor performance of drives. - Provide informal training for customer. **ID FANS TURNED OVER TO IPSC OPS**
APRIL 3, 2005 - Monitor performance of drives. - Provide informal training for customer.	**APRIL 4, 2005** - Monitor performance of drives. **UNIT 1 GEN AT FULL LOAD**	**APRIL 5, 2005** - Monitor performance of drives.	**APRIL 6, 2005** - Monitor performance of drives.			

IP7015439

JERRY AVEY, need your help. There are three questions we need to get answers on regarding the 8 motors supplied 4 each on SOs 1729AA and 1729AB. They are buying new Alstom LCI drives with digital controls to power these synchronous motors. The questions are:
1. What are the Volts/Hz limits for this motor design? He's interested in flattening out the curve for PF control. Please use 76.3

2. The drives OEMs who bid on the drives told Intermountain Power that the current (amps) value we show on the outline drawing for the 3 winding connection appear to be wrong - don't make sense. What are the correct values? Please elaborate on what does not make sense because these values were checked

3. Can the motors be operated at 4160V? yes, continuos duty at 4160 is no problem with the motors.

NAME OF DOCUMENT:

Service Resume - John A. Benz

SERVICE DATE: 08/20/66

DIVISION: Electrical Project Engineering Division

TITLE: Senior Electrical Project Engineer

EDUCATION

Illinois Institute of Technology - B.S. Electrical Engineering - 1968

REGISTRATIONS

Professional Engineer - Illinois, Indiana, Louisiana, Mississippi

PROFICIENCIES

Adjustable speed drive
Betterment and backfit
Combustion turbines
Electrical engineering and design
Fossil plant betterment
Flue gas desulfurization (FGD)
Condition assessment
Project coordination
Sizing and selection of electrical equipment
Water treatment electrical design
SCR's

RESPONSIBILITIES

As engineering manager and senior project engineer, Mr. Benz coordinates the electrical engineering work on projects to which he is assigned. He is responsible for sizing and arranging electrical equipment and for developing procurement specifications to purchase the equipment. Mr. Benz formulates and monitors project schedules, evaluates bidders' proposals, recommends purchases, and reviews contractors' designs and drawings for compliance with the contract. His responsibilities include establishing conformance with applicable criteria, standards, and

procedures. He directs the preparation of installation drawings and is responsible for coordinating the electrical interface with other Sargent & Lundy (S&L) departments. He confers with client, manufacturer, and contractor representatives to see that electrical equipment designs, construction, and installations meet project specifications and client requirements.

EXPERIENCE

Mr. Benz is an engineering manager of S&L and has more than 33 years of experience in electrical engineering and design for major coal-fired steam electric generating stations. He has worked on new coal-fired and combustion turbine projects as well as many betterment projects. His experience includes modifications and upgrades to existing units; condition assessment studies; electrical design of new fossil units; and installation of adjustable-speed fans, baghouses, and electrostatic precipitators.

Mr. Benz is currently the senior electrical project engineer on all of S&L's fossil betterment projects for Ameren Services, Cinergy and Calpine. He also has served as a senior electrical project engineer for the work on several other projects for different clients.

His specific experience includes the following projects:

COMBUSTION TURBINE DESIGN

- **Calpine**
  - 705 MW new 2x1 combustion turbines. (1997 to present)

- **PSI Energy**
  - Wabash River, new combustion turbine 196 MW and repowered existing 105 MW steam turbine. Senior Electrical Project Engineer. Complete design. (1991 to 1996)

- **Iowa Power**
  - Pleasant Hill Energy Center 1-4, dual fuel combustion turbines, 38 MW each. Senior Electrical Project Engineer. (1988 to 1989)

COAL-FIRED DESIGN

- **Middle South Services**
  - Six standard units, 820 MW each.Senior Electrical Project Engineer. (1978 to 1991)

- **PSI Energy**
  - Gibson 1-5, 618 MW each. Senior Electrical Project Engineer. Complete design. (1972 to 1982)
  - Cayuga 1 and 2, coal, 531 MW each. Electrical Project Engineer. Complete design. (1968 to 1972)
  - Wabash River 6, coal, 365 MW. Electrical Project Engineer. Complete design. (1966 to 1968)

CONDITION ASSESSMENT

- **PSI Energy**
  - Various stations. Provide assistance to client relative to fossil betterment program. (1988 to 1990)
  - Edwardsport, coal, 98 MW. Performed electrical activities necessary to develop a list of betterment projects and budget costs to extend the life of the station, including possible fuel switching. (1988 to 1989)
  - Noblesville coal, 120 MW.

Performed electrical activities necessary to develop a list of betterment projects and budget costs to extend the life of the station. (1988 to 1989)

- Gallagher 4, coal, 150 MW.
  Performed electrical aspects of life extension study. (1985 to 1986)

- **Iowa Power**
  - Council Bluffs 1 and 2, coal and gas, 121 MW total.
    Performed electrical portion of work for a life extension study. (1989)

- **Inland Steel**
  - 4AC.
    Performed electrical project engineering associated with life extension study, including station walkdown; interview of operating and maintenance (O&M) personnel; and development of list of prioritized examinations and tests. (1988)

- **Montana-Dakota Utilities**
  - Heskett 1 and 2, coal, 100 MW total.
    Performed electrical aspects of Phase I life extension study. (1988)
  - Cayuga 1 and 2, coal, 531 MW each.
    Converted the boilers to balanced-draft and performed miscellaneous backfit work. (1976)
  - Markland 1-3, pumped hydro, 27 MW each.
    Provided electrical design work for the installation of a fire protection system. (1966 to 1967)

- **Commonwealth Edison Company**
  - All fossil stations.
    Various projects, including peaking unit controls replacement upgrade project

  - Lewis & Clark 1, coal and natural gas, 500 MW.
    Performed electrical aspects of Phase I life extension study. (1988)

- **Montana Power Company**
  - F. W. Bird 1, coal, 60 MW.
    Performed electrical aspects of life extension study. (1985)

BETTERMENT AND BACKFIT

- **Carolina Power & Light Company**
  - Roxboro 2, coal, 670 MW.
    Electrical Project Engineer. Design of new mills. (1995 to 1997)

- **PSI Energy**
  - Gibson 1-5, coal, 618 MW each.
    Provided electrical design work for miscellaneous design work. (1975 to 1994)

  - Wabash River 1-6, coal, 1251 MW total.
    Provided electrical design work for miscellaneous projects. (1988 to 1993)

(Crawford), continuous emission monitoring system installation designs (Collins and Kincaid), an annunciator replacement (Crawford), zebra mussel mitigation (Crawford, Waukegan, and Will County), a zebra mussel study (Joliet), a switchgear bus 441/442 study (Crawford), an induced-draft fan study (Kincaid), and fiber optic cable installations (Kincaid and Will County). (1989 to 1993)

- **Iowa Southern Utilities Company**
  - Burlington, coal, 207 MW.
    Performed coal study of balanced draft

conversion alternatives and development of variable-speed induced-draft fan specification. (1988)

- **Iowa Power**
  - Des Moines 6 and 7, coal and gas, 188 MW total.
    Electrical project engineering associated with the development of initial scheduling, permitting evaluation, and O&M and capital cost projections to support preliminary engineering of fluidized bed boilers and gas turbine installation. (1987 to 1988)

- **Houston Lighting & Power Company**
  - P. H. Robinson 1-4, gas, 2177 MW total.
    Provided electrical design for upgrade of cooling towers. (1986)

  - W. A. Parish 5-7, coal, 1823 MW total.
    Provided electrical design for the installation of twelve 7000 horsepower variable-speed induced-draft fans and installed baghouses for each unit. (1984)

- **Oklahoma Gas and Electric Company**
  - Mustang 1 and 2, gas, 100 MW each.
    Provided electrical design for burner control system upgrade. (1984 to 1985)

- **Commonwealth Edison Company**
  - Kincaid 1 and 2, coal, 660 MW each.
    Compliance study and preliminary design. (1991 to 1992)

- **Middle South Services**
  - Six standard units, 820 MW each.
    Provided electrical design of FGD systems. (1981 to 1987)

PUBLICATIONS

ELECTROSTATIC PRECIPITATORS

- **PSI Energy**
  - Wabash River 1-6, coal, 886 MW total.
    Provided electrical design work, including installation of electrostatic precipitators. (1970 to 1993)

  - Gallagher 1-4, coal, 150 MW each.
    Provided electrical design for the installation of electrostatic precipitators. (1966 to 1970)

FLUE GAS DESULFURIZATION

- **PSI Energy**
  - Gibson 4, coal, 668 MW.
    Provided electrical design for installation of scrubber system to comply with acid rain requirements. (1989 to 1994)

  - Gibson 3 and 4, coal, 668 MW each.
    Provided electrical input for FGD system studies. (1989)

  - Gibson 5, coal, 668 MW.
    Provided electrical design for installation of wet scrubber system, including reactant system. (1980 to 1982)

"Economic and Operational Benefits from Retrofitting Variable Speed Drives," American Power Conference, Chicago, Illinois, April 1994

"Adjustable Speed Drives" (coauthor), American Power Conference, Chicago, Illinois, April 1991

COMMITTEES

Mr. Benz is an IEEE member and a member of the IEEE Power Engineering Society, P958 Working Group for Applications of ASDs.

EMERGENCY RESPONSE/RECOVERY

- **Oklahoma Gas & Electric**
  Sooner 2, coal, 569 MW
  Recovery from fire.

- **PSI Energy**
  Cayuga 1 and 2, coal, 531 MW each
  Wabash River 1-6, coal, 1251 MW total
  Recovery from coal and lubricating oil fires

- **Central Illinois Public Service Company**
  Newton 1 & 2, coal, 617 MW each
  Recovery from chemical explosion in water treating area.

- **Stateline**
  Units 3 and 4
  Recovery from major fire.

SCR PROJECTS

- **Associated Electric Coop.**
  New Madrid station SCR. Overview.

- **Ameren**
  Coffeen Units 1 & 2
  Sioux Units 1 & 2

- **Cinergy**
  Gibson Units 1-5
  Cayuga Units 1 & 2
  Miami Fort Units 7&8
  East Bend
  Zimmer

Meeting with ALSTOM on 10/15/03 at IPSC.
Those present:

Jon P. Christensen	IPSC
David M. Smith	ALSTOM
Roger Grace	
Steve	
John	
Ivan	
John A. Benz	Sargent & Lundy

The purpose of the meeting was to review the contract and walk down the Variable Speed Drive (VFD) room as part of IPSC's reliability improvement project for the I D Fans.

IPSC (Jon Christensen) stated that Gerry Finlinson is the controls engineer, Pam Bahr is the electrical engineer, Kevin Miller is the maintenance planner, and Bob Wright is the supervisor of the Unit 2 electricians.

All technical items should be directed to Jon Christensen and all commercial items should be directed to John Larson. ALSTOM (Steve) said that the T&C' s were all agreed to.

IPSC reminded ALSTOM that they needed to forward the letter to IPSC stating that they will support the VFD's that are part of the project for the next 20 years including spare part availability. This will become part of the contract.
Action: ALSTOM to provide letter week of 10/20/03.

The Unit 2 outage starts after load reduction in LA on 2/27/04, at 7 AM on the 28th IPSC electricians will disconnect all field cables and pull them back to the cable tray under the drives. This is scheduled for one day, the removal of 2D existing VFD's will start on 2/29/04 and the setting in place of the new 2D drives will be complete on 3/1/04. ALSTOM will be on site for inspection of the new equipment. After inspection ALSTOM shall provide a letter to IPSC stating that the equipment is installed correctly and the warranty is in effect.

IPSC requested advanced training for their personal so they can become familiar with the system and the controls. ALSTOM stated that they have a 4-day class but it includes some generic information on LCI type drives. ALSTOM may reduce the class to a 3-day class since the majority of IPSC personal are familiar with LCI drives. ALSTOM to provide a quote to IPSC for a training class on just the controls with additional time for generic LCI training if IPSC would want to sent some personal for generic training.
Action: ALSTOM to provide letter week of 10/20/03.

Spare parts was discussed and it was agreed that any spare parts that are used during startup will be replaced at no cost to IPSC this is necessary so IPSC has a full set of spare parts after startup.

It was agreed that there would be a status conference call every two weeks the exact day will be agreed upon later.

The schedule in the proposal was discussed and it was agreed that the days for submittal are working days not calendar days. Based on this the following is a list of submittals and the dates they are due.

TASKS	DATE
Efficiency & pf values	10/27/03 (15 days)
Detailed schedule	10/27/03 (15 days)
Detailed Engineering Sch	10/27/03 (15 days)
Procurement sch	10/27/03 (15 days)
Outline drawings	10/27/03 (15 days)
Design conference	10/27/03 (15 days)
Torsional Analysis HOLD	11/3/03 (20 days)
Interface & Seismic	11/3/03 (20 days)
Anchor bolt complete	11/3/03 (20 days)
Schematic & Wiring	11/17/03 (30 days)
Hazardous Material Doc	11/3/03 (20 days)
I/O list to plant control	11/3/03 (20 days)
Block diagrams	11/3/03 (20 days)
Single lines	11/3/03 (20 days)
Recommended erection	11/3/03 (20 days)

ALSOM handed out a schedule that showed the wiring and schematics much earlier 1027/03. After some discussion it was agreed that the drawings would be submitted via AUTO CAD with one hard copy. It was also agreed that the drawing (outlines, wiring and schematics and I/O list would be submitted by the end of October and that a review meeting would be held the first week of November (11/4/03) at IPSC office. ALSTOM to confirm the date by 10/21/03.
Action: ALSTOM to confirm date for drawing review at IPSC office.

IPSC stressed the on site date and stated that the drive shall be on site no latter than 2/25/04.

The water to water heat exchanger was discussed and IPSC confirmed that their water is a 50-50 mixture of water and glycol. ALSTOM stated that they intend to use pure water in their equipment.

The color of the drive cabinets was discussed and ALSTOM stated they would provide any color IPSC wanted. It was agreed that the cabinet would be ANSI 61 gray.

IPSC stressed the fact that MSDS sheets were required on everything including the resin, touch up paint and any lubricant that is furnished.

IPSC stressed that their unique number had to be added to all ALSTOM drawings and on anything that interfaces with IPSC.

ALSOTM stated that no special tools were required. After some discussion it was agreed that a special crimp tool may be required to replace some internal wiring if it every became necessary. ALSTOM to provide cut sheets on any special tools required.
Action: ALSTOM to provide cut sheets the week of 10/20/03.

IPSC stressed that everything had to be screwed down including the wire raps no clueing is allowed however it is acceptable to use stickon wire raps providing they are screwed down before shipment. IPSC also requested that AVO International (States) type terminal blocks be used for all connections to IPSC wiring. Indicating lights were also discussed and IPSC stressed that all indicating lights should be large i.e. 32 mm. ALSTOM to verify that indicating lights are being furnished for the contactor.

Instruction books were discussed and ALSTOM requested that have at least one month after startup to include all documentation in the instruction books. IPSC stated they would not award the next drive until they have received all documentation including final instruction books and had sufficient time to review them, a minimum of 30 days.

The interface with the motor was discussed. IPSC requested a letter from ALSTOM detailing everything that TECO Westinghouse had to review including what was necessary for 8200 HP and single channel operation. The list should be very specific.
Action: ALSTOM to provide letter week of 10/20/03.

ALSTOM to provide a take out price for deletion of the torsional analysis.
Action: ALSTOM to provide takeout price the week of 10/20/03.

The I/O list was discussed and it was agreed that ALSTOM would submit a revise the I/O list based on the external cabling and submit to IPSC early next week. ALSTOM stated they would wire all spare I/O points to terminal blocks.
Action: ALSTOM to submit revised I/O list by 10/22/03.

The only items on the doors of the drive will be the HMI, a reset push button and the programming port.

ALSTOM discussed an encoder and suggested that it be added to the motor. IPSC will investigate and inform ALSTOM if they plan on adding it.

John Benz
10/17/03

ID FAN PROJECT UPDATE/SCHEDULE
December 22, 2004

1. Training

   a. Class - Pittsburgh January 10 through 14, 2005
      i. Course Outline (preliminary)
         (1) Documentation Overview
         (2) Initial troubleshooting/alarm review
         (3) Controller (Sigma, Spang, Red Lion) setup and programming
         (4) Hands on troubleshooting
      ii. Pre-course work
         (1) Review instruction books and information on the N drive

   b. Commissioning March 9 through 20, 2005
      i. Alstom proposal - IPSC labor /Alstom labor

   c. Controller replacement /setup March 21 through 25, 2005
      i. One electrician per channel (link) per day - 10 electricians total

   d. Future

2. Unit 2 Outage work - Unit 2 'D' Regulator Cabinet modifications
   a. Pre-outage
      i. Before February 11 verify labels on all cables
   b. February 11, 2005
      i. Disconnect cables, in the regulator cubicles, and lay them in cable tray. Two shifts of 2 electricians (one per channel) 12 hour days
   c. February 12, through February 20, 2005
      i. Assist Alstom with rewiring and commissioning (Alstom 16 hour days)

3. Unit 1 Outage work - Unit 1 'C & D' Drive installations
   a. Pre-outage
      i. Verify labels on all cables
   b. February 14 through 18, 2005
      i. Assist with encoder installations
   c. February 26 though March 6, 2005
      i. Complete all inspections on transformers, motors. Assist electrical contractor with drive installation and wiring.
   d. March 8, through 20, 2005
      i. IPSC or Alstom commissions the drives

4. Other topics

From: <john.bradley@tde.alstom.com>
To: <jon-c@ipsc.com>
Date: 10/23/2003 7:49:41 AM
Subject: Regualtor Door Indication

Jon,

Per our telephonic conversation, we are going to add 2 lamp indications to the door (above the HMI) to indicate the following:

Drive Running	Red
Drive Healthy	Amber

Regards

john b

CC: <steve.klein@tde.alstom.com>, <william.oleyar@tde.alstom.com>

From: Bret Kent
To: Nathan Crop
Date: 12/23/2005 7:37:40 AM
Subject: Re: ID fan ventilation covers?

The return registers are located in Warehouse 4. There are enough to finish both U1 and U2, so make sure the left overs don't get lost. Let me know if you want me to work with the warehouse to have them pulled out.

Bret

>>> Nathan Crop 12/22/2005 6:51:17 AM >>>
Bret,
In preparation for my ID fan stuff this upcoming 2006 outage I need to know if we have on site the ventilation covers.
Nathan

Electrical Engineer
850 West Brush Wellman Road
Delta, UT 84624-9522
Telephone (435) 864-6483
home: (435) 864-8429
Fax (435) 864-6670
E-mail: nathan-c@ipsc.com

>>> Nathan Crop 12/19/2005 5:09:03 PM >>>
Nathan
Order or find out how to order ventilation covers for the duct above the ID fan drives.
Nathan

Electrical Engineer
850 West Brush Wellman Road
Delta, UT 84624-9522
Telephone (435) 864-6483
home: (435) 864-8429

Fax (435) 864-6670
E-mail: nathan-c@ipsc.com

ALSTOM REPLY TO DRAWING REVIEW OF 12/16/03
APPROVAL DRAWINGS SUBMITTED 12/11/03

General comments

1. In the title bock change IPCS to IPSC.
   a. AGREE

2. On all drawings that show a SS shipping split, there are many that only show the SS on one side and the other side is to a terminal block. Show the SS on both ends of the cable.
   a. DISAGREE. When reading the drawings distinction between SS1 and SS2 need to be made.

3. Show all relay contacts.
   a. IPP and Alstom agreed to list all the relays and the corresponding manufacturers part number on the drawing sheet upon which the coil of the relevant relay is indicated.

4. Drawing Numbering System

Alstom Drawing Number	Unit Designation	Project Equipment	IPP Drawing #
2000-8100-01	Unit 2	2CCE-EXX-1D2	63.2203.1.05-240001
2000-8100-02	Unit 2	2CCE-EXX-1D1	63.2203.1.05-240002
GD70107\2001-RR1	Unit 2	2CCE-EXX-1D	63.2203.1.05-240003
GD70107\2001-001	Unit 2	2CCE-EXX-1D	63.2203.1.05-240004
GD70107\2001-002	Unit 2	2CCE-EXX-1D	63.2203.1.05-240005
GD70107\2001-003	Unit 2	2CCE-EXX-1D	63.2203.1.05-240006
GD70107\2001-004	Unit 2	2CCE-EXX-1D	63.2203.1.05-240007
GD70107\2001-005	Unit 2	2CCE-EXX-1D	63.2203.1.05-240008
GD70107\2001-006	Unit 2	2CCE-EXX-1D	63.2203.1.05-240009
GD70107\2001-007	Unit 2	2CCE-EXX-1D	63.2203.1.05-240010
GD70107\2001-007A	Unit 2	2CCE-EXX-1D	63.2203.1.05-240011
GD70107\2001-008	Unit 2	2CCE-EXX-1D	63.2203.1.05-240012
GD70107\2001-008A	Unit 2	2CCE-EXX-1D	63.2203.1.05-240013
GD70107\2001-008B	Unit 2	2CCE-EXX-1D	63.2203.1.05-240014
GD70107\2001-009	Unit 2	2CCE-EXX-1D	63.2203.1.05-240015
GD70107\2001-010	Unit 2	2CCE-EXX-1D	63.2203.1.05-240016
GD70107\2001-011	Unit 2	2CCE-EXX-1D	63.2203.1.05-240017
GD70107\2001-012A	Unit 2	2CCE-EXX-1D1	63.2203.1.05-240018
GD70107\2001-012B	Unit 2	2CCE-EXX-1D1	63.2203.1.05-240019
GD70107\2001-0012C	Unit 2	2CCE-EXX-1D2	63.2203.1.05-240020
GD70107\2001-0012D	Unit 2	2CCE-EXX-1D2	63.2203.1.05-240021
GD70107\2001-0013	Unit 2	2CCE-EXX-1D	63.2203.1.05-240022
GD70107\2001-101	Unit 2	2CCE-EXX-1D	63.2203.1.05-240023

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GD70107\2001-102	Unit 2	2CCE-EXX-1D	63.2203.1.05-240024
GD70107\2001-103	Unit 2	2CCE-EXX-1D	63.2203.1.05-240025
GD70107\2001-104	Unit 2	2CCE-EXX-1D	63.2203.1.05-240026
GD70107\2001-105	Unit 2	2CCE-EXX-1D	63.2203.1.05-240027
GD70107\2001-106	Unit 2	2CCE-EXX-1D	63.2203.1.05-240028
GD70107\2001-107	Unit 2	2CCE-EXX-1D	63.2203.1.05-240029
QF0209r1	*not required*	*not required*	63.2203.1.05-900001*
C-13467 sheet 1 of 1	*not required*	*not required*	63.2203.1.05-900002*
NP-11198 sheet 1 of 2	*not required*	*not required*	63.2203.1.05-900003*
NP-11198 sheet 2 of 2	*not required*	*not required*	63.2203.1.05-900004*
CW-12560	*not required*	*not required*	63.2203.1.05-900006*
CW-12561	*not required*	*not required*	63.2203.1.05-900005*

* The IPP drawing numbers for the motor operated switch assumes the switch drawings are generic for all eight drive assemblies. If separate drawings are being furnished for each drive assembly the numbers will be changed to reflect the correct unit number.

IPP numbering scheme

63.2203.1.AA-BCDDDD

63.2203.1	Alstom Contract 45605	
AA	drawings	.05
	reports	.06
	instruction books	.07
B	Unit 1, 2 or 9 (common equipment)	
C	equipment number	A drive is 1, B drive is 2, C drive is 3, D drive is 4
DDDD	sequential number for each vendor drawing number	

Note the change made to shts 12A, 12B, 12C, and 12D

Drawing No. GD70107/2000-8100-01 and -02

1. Provide a detail drawing of the bus connections for the high voltage power cable connections. Verify electrical clearances are in accordance with ANSI standards, including any de-rating required for elevation. Provide detailed information on cable connection including bolt torques, bolting assembly and installation requirements. Submit details of the power cable connections.
   a. Alstom shall:
      - Verify all clearances with respect to the altitude.
      - Verify and record shipping split buss bolts torque.
      - Indicate the elevation of the HV terminations.
2. Submit details of the anchor bolts including size and type of installation with a Structural PE stamp on the calculation and details. Seismic details shall be based on installation on the existing floors.

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a. Alstom will discuss this with the PE doing the seismic evaluation and advise IPSC

3. Provide cabinet layout drawings showing major components and terminal blocks.
   a. Alstom will review the existing arrangement and add it to the schematics at a time no later then the release of the "AS BUILT" schematics.

Drawing No. GD70107/2001-RR1

1. See General comments

Drawing No GD70107/2001-001

1. Add terminal numbers on this drawing for all cabling, including DC Link Reactors, exciters and shaft encoders.
   a. Alstom will add the terminal block numbers for the reactors, the excitation terminal block numbers and the encoders terminal block numbers. All control cables and their associated cable numbers only will also be added.

Drawing. GD70107/2001- 002

1. Show shipping splits (SS) in a consistent manner. At A10 it shows a SS and the other end of the cable on 008A-H13 also shows a SS. Show shipping splits on both ends of each cable.
   a. DISAGREE. When reading the drawings distinction of SS1 needs to be made from SS2.
2. At U10 add drawing number for disconnect switch.
   a. AGREE. CW-12561 will be added to this sheet to reference the output switch.
3. The existing DC Link Reactor has a distribution class arrestor connected to the line terminal. This should be shown on this drawing.
   a. AGREE.

Drawing. No GD70107/2001- 003

1. At P3 provide the reference drawing MN/H4294
   a. This reference will be removed from this schematic as no ribbon cable terminations are shown.
2. The cross-reference at B9 and G9 are reversed for the 25 ribbon cables.
   a. AGREE.
3. At V6 the cross-reference should be U11 not U1.
   a. AGREE.

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Drawing No. GD70107/2001- 004

1. The cross-reference at E2 and R2 are reversed for the 25 ribbon cables, See comment on sheet 2001–003.
   a. AGREE

Drawing No. GD70107/2001- 005

1. There should be a SS at E9 for the 24 VDC cable 1030.
   a. DISAGREE. See general comments.

Drawing No. GD70107/2001- 006

1. No exceptions noted.

Drawing No. GD70107/2001- 007

1. At R15, change the dashed outline to a solid line to indicate the resistors are furnished by Alstom.
   a. AGREE.

Drawing No. GD70107/2001- 007A

1. Provide a write up of operation and logic diagrams.
   a. This will be provided with the instruction books post commissioning.
2. All spare analog circuits are to be 4 – 20 mA.
   a. AGREE.
3. At P11 add contact numbers to SOR both contacts.
   a. AGREE.
4. At T11 the speed feedback should be 150-1100RPM.
   a. AGREE.
5. At R3 the cable to exciter is shown as twisted and the other side is shown as shielded, what is correct?
   a. AGREE.

Drawing No. GD70107/2001- 008

1. At P12 where is DIS used? Provide reference to switch drawings.
   a. AGREE

Drawing No. GD70107/2001- 008A

1. No exceptions noted.

Drawing No. GD70107/2001-008B

1. No exceptions noted.

Drawing No. GD70107/2001-009

1. At K12 the exciter cable is shown as shielded on other side it is twisted, what is correct?
   a. AGREE.
2. At P6 the FCN top connect needs contact numbers. This complete contact has to be looked at.
   a. AGREE.

Drawing No. GD70107/2001-010

1. At E3 add wire 1056 to TB2-8.
   a. AGREE
2. At C15 TB2-1 should be 1037 wire # per other end, correct.
   a. The other end on 12A/C is corrected.
3. At C15 TB2-2 should be 1038 wire # per other end, correct.
   a. The other end on 12A/C is corrected.
4. At K7 wire # 1019D should cross-reference 11-F13 not 11-B13.
   a. AGREE
5. At U6 wire # 1026 add TB3-21.
   a. AGREE
6. At U6 wire # 1027 add TB2-22
   a. AGREE
7. At U9 wire number 1031 should go to 011-F2 not 011-B2. 2001-011.
   a. AGREE

Drawing No. GD70107/2001-011

1. At E5 the light should be A not G.
   a. AGREE
2. At D14 the wiring of FCN has to be checked as well as TB's. see sheet 009 P5.
   a. AGREE
3. At J15 add contact numbers to FCN, check wiring of FCN last contact.
   a. AGREE.
4. At J15 relay BKTP shows 2 contacts (not numbered) on sheet 12A and 12C it shows both contacts in series. If in series need to show 4 contacts not 2.
   a. AGREE.
5. At T2 terminal TB2-4 should be wire #1039.
   a. AGREE.

Drawing No. GD70107/2001-012A

General comments for the wiring drawings 12A, 12B, 12C and 12D

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The circuit numbers do not have any hyphens or spaces to differentiate them from the drawing numbers. A typical circuit number would be 2CCEK2127B01. The drawing number associated with that circuit is 2CCE-K2127B.

Attached is a revised drawing for 12A showing the correct format.

1. TB2-1 should be wire # 1046
   a. AGREE — Formatted: Bullets and Numbering
2. TB2-2 should be wire # 1047
   a. AGREE — Formatted: Bullets and Numbering
3. TB2-4 should be wire # 1049A and cross-reference should be 011-T3
   a. AGREE — Formatted: Bullets and Numbering
4. TB2-5 should be wire # 1017
   a. AGREE — Formatted: Bullets and Numbering
5. TB2-6 should be wire #1019 and cross reference should be 010-B2 not N1
   a. AGREE — Formatted: Bullets and Numbering
6. TB2-7 and 8 should NOT show a wire on sheet 12A it is only on sheet 12C
   a. DISAGREE. Alstom shall wire this supply to TB2:7&8. Should it only be used on CH2 this difference shall be noted on the cabling drawings. Both channels wiring will be identical. — Formatted: Bullets and Numbering
7. At L19 cross-reference should be 010-E5 not 010-C5.
   a. AGREE — Formatted: Bullets and Numbering
8. TB2-11 and 12 each show a contact (2 in series) not that way on other end.
   a. AGREE — Formatted: Bullets and Numbering
9. Contact on TB3-36 and 37 should be numbered. — Deleted:
   a. AGREE. — Formatted: Bullets and Numbering

Drawing No. GD70107/2001-012B

1. Correct the format to match 12A.
   a. AGREE — Formatted: Bullets and Numbering

Drawing No. GD70107/2001-013

1. No exceptions noted.
   a. AGREE — Formatted: Bullets and Numbering

Drawing No. GD70107/2001-101

1. Show all contacts on all relays
   a. See general comments. — Formatted: Bullets and Numbering

Drawing No. GD70107/2001-102

1. At N8 cross reference should be 101-M2 not M7.
    a. DISAGREE. Cross-references refer to the coil and not the contact.
2. At N11 cross reference should be 101-N2 not N7.
    a. DISAGREE. Cross-references refer to the coil and not the contact.
3. The OL is before the contactor, I have always seen it after the contactor i.e. between the contactor and motor. It will work but what do you want.
    a. DISAGREE. IPSC with S&L will discuss this and see what they prefer. Be aware that the hole pattern for these relays has already been drilled.
4. The OL is set at 1.5 amps, too low the FLA is 1.4 per this drawing and 2.5 per sheet 106. What is correct?
    a. AGREE.

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Drawing No. GD70107/2001-103

1. At L all cross-references letter 7 should be letter 2.
    a. DISAGREE. Cross-references refer to the coil and not the contact.
2. At M18 and M19 the last two wires should have a wire # 1030.
    a. AGREE
3. At M4 wire #10311 should be 10318
    a. DISAGREE. There is still a problem with the #10311 wire that will be rectified.
4. At P2 cross-reference 011-B11 should be 011F11.
    a. AGREE

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Drawing No. GD70107/2001-104

1. TBP1-17 on the left side should be wire # 10311 per cross reference, yet the other side 10318 is correct per the cross reference.
    a. DISAGREE. This concern does hoever tie in with **Drawing No. GD70107/2001-103** #3 above and will be rectified.

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Drawing No. GD70107/2001-105

1. At R12 the low point drain goes where? To the drip pan?
    a. As discussed, this is a drain point and not a spillage recovery point. This will have a quick disconnect output to which customers can connect a flexible hose in the event they wish to drain the cooling system.

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Drawing No. GD70107/2001-106

1. The motor data is different FLA 2.5 on sheet 104 it is 1.4.
    a. AGREE
2. At G14 install at lowest point, does it go to drip pan?
    a. No. Once again this is another drainage point, this time in the pump cabinet.

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3. At B17 is the drain and is shows in the base at ground on the GA, how to you drain any water? Is there a valve? How can you drain it to a container since the drain is at floor level. Water will not run up hill.
    a. This is a collection point. Obviously it has to be at the lowest point in the cabinet since, as you mentioned, water cannot run uphill. Therefore ground level or close to it is the only suitable place. Draining the drip pan is normally accomplished by using a rag, as spillage is not normally significant enough to warrant draining it. Should draining be required, it then becomes the responsibility of the commissioning/maintenance staff.

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Drawing No. CW-12561 and CW-12560

1. Add cross reference to Alstom drawings for 120 V.AC.
    a. DISAGREE. Alstom cannot expect vendor drawings to cross reference to Alstom drawings. In order to get around this problem the Alstom cabling drawings 12A & 12 C will cross reference to drawing number CW12560.
2. Drawing shows remote start and stop. What is this?
    a. The close and open from the drive.

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Drawing No.C-13467

1. Still shows a J bolt, this will not work.
    a. This is a recommendation and not a prerequisite. It will however be remaoved from the drawings.
2. Submit details of the anchor bolts including size and type of installation with a Structural PE stamp on the calculation and details.
    a. Alstom will discuss this with the switch manufacturer and advise IPSC.
3. Drawing shows 5 foot aisle not available
    a. Alstom will discuss this with the switch manufacturer and advise IPSC.
4. The remote control conduit, if used would have to be core drilled.
    a. This will not be used.
5. The enclosure has to be gasketed.
    a. Alstom will discuss this with the switch manufacturer and advise IPSC.

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Intermountain Power Service Corporation
Specifications 45605
And
Bidding Documents

Request for Clarification on Specification and Bidding Documents

RFP Questions for IPSC

Part B – Division B2 Article 1 states "IPSC will notify the successful bidder by the option date listed in Division C2, of the total quantity of VFD Systems required.

Please clarify:

- Is this an RFP for 8 VFD systems or for 1 with an option for up to 7 more?
- If 8, is the option date the date IPSC will determine how many of the 7 balance will be delivered at the dates specified in Part C – Division C2

IPSC response

The intent of the RFP is to purchase one drive system with the option to purchase seven more. Your proposal should be based on the Proposal Schedule and Pricing shown in Part C- Division C2 which requires separate pricing for one drive system in 2004, two drive systems in 2005, three drive systems in 2006 and one drive system in 2007. Division C2 also requires each bidder to specify the latest date for IPSC to exercise the option to purchase the drive systems furnished after 2004.

Division C3 – Page C3-3, Item 4 – Please identify the locations of the existing cable trays that run below the mezzanine floor. Please confirm that the cable trays run the length of the floor. Please confirm the direction from which the power cable to the motors runs in the tray.

IPSC response

The cable trays run the length of the floor centered under the floor penetrations show on the drawings previously provided. The high voltage cables enter and exit the building on the first floor in a cable trench near the southwest corner of the room. The cables are routed to minimize the total cable length. For example the cables to the 'D' motor (motor located furthest west) run from the drives are run to the west. The cables to the 'A' motor leave the drive towards the east.

Part F – Division F2, Article 4 – States "Increased fan capacity to allow a 950 MW generating capacity with three (3) fans…" As no load requirement is defined for this goal it is assumed that the 10,000 HP design goal for the VFD will meet this requirement. Please clarify.

IPSC response

At 950 MW, each drive system is required to be rated 8,200 HP to provide the capability of operating with only three fans in service.

Part F – Division F2, Article 7 – Although only two power sources are specified (6.9 kV and 125 VDC, review of the existing Westinghouse drawings clearly indicate that the following additional power sources are available from IPSC:

- 480 VAC, 3 PH for cooling fan motors
- 120 VAC, 1 PH, UPS backed source for VFD control.

Please confirm.

IPSC response

You are correct. There is also a separate 480 VAC source for the excitation system.

Part F – Division F3 – There are numerous detailed design requirements noted, requirements which would cause the solution presented to be in direct conflict with the statement in Part F – Division F7 – Article 1, Paragraph 2 which states: "To the extent possible, considering the application is a retrofit application, the intent is to purchase the suppliers standard equipment with needed available options." It would therefore be our interpretation that we should simply clarify the inconsistencies between the Division F3 General Requirements and our standard delivery. Please clarify or confirm.

IPSC response

The intent was to purchase a standard drive system. Each bidder should identify exceptions, to the specifications, which require modifications to their standard system. During the bid evaluation IPSC, in discussions with the various bidders, will determine which modifications are required.

Part F – Division F7 – Article 1.d. Codes and Standards – Please clarify whether the intent is build the VFD system to UL Standard or to provide a UL label for the VFD. It is further assumed that the proposed spacing of the replacement equipment should consider NEC spacing requirements (it is noted that the existing equipment does not meet the requirement).

IPSC response

The intent is to purchase a labeled system that can be installed in compliance with NEC requirements. IPSC will consider systems that are not independently labeled or that can not be installed in accordance with NEC requirements. The bid

proposals shall clearly indicate whether the drive systems are labeled and should include drawings which allow IPSC to determine the access space around the drive systems.

Part F – Division F7 – Article 2.a. Please clarify that the existing TWMC motor is being operated on turning gear at 10% of rated speed (95 RPM). If not, please define the current minimum speed for Motor/Fan operation.

IPSC response

Turning gear speed is 95 rpm.

Part F – Division F7 – Article 3.b. is inconsistent with the data provided in Part F7- Article 9.b. As the data in Part F7-1 appears to be site specific, it is assumed that this data is correct. Please confirm or clarify.

IPSC response

Use the data in Part F7-1.

Part F – Division F7 – Article 8.b. – Please confirm that 5 total analog control signals are required. We would provide 2 A/I and 4 A/O as standard. Additional are available. Please confirm.

IPSC response

The speed control signal for the drives is a single 4-20 ma signal, for each fan, from the burner control system. Article 8.b refers to the requirement for five additional analog monitoring signals from each drive. These signals will be used to provide remote speed, voltage, dc current, and ac voltage and current indication.

Part F – Division F7 – Article 10 calls for a load break disconnect switch only to be provided. It is noted that the existing VFDs are provided with output contactors with no load disconnect switch. Please confirm that a load break disconnect switch only is required.

IPSC response

The existing contactor is designed to isolate the drive from the motor so that maintenance can be performed on the drive while the motor is in service. It is electrically interlocked so that it can't be operated unless the drive is turned off.

A similar feature, either a switch or contactor, with a visible air gap is required on the new drive systems.

Request for Clarification on Specification and Bidding Documents

Part F – Division F8 – Article 13 – The secondary winding configuration specified is not consistent with a 24-pulse system. It is suggested that the vendor define this configuration.

IPSC response

We agree. The bidders are required to identify transformers which are fully compatible with their drive systems.

General – Please confirm the installation ambient range. According to the existing motor drawings the maximum ambient is 45 C. The specification calls for a maximum ambient of 50 C. The minimum ambient is not consistently listed. Please clarify the correct ambient range for the mezzanine area where the VFD will be installed.

IPSC response

This was clarified in a previous e-mail. All indoor equipment shall be designed for a 0 to 50 C ambient. All outdoor equipment shall be designed for a –35 to 50 C ambient.

General – The Westinghouse drawings indicate that each VFD Channel includes an exciter. There is no drawing provides that indicates how the exciters are interfaced to the single motor brushless exciter.

IPSC response

The existing configuration uses two drives per motor. Each drive has a complete exciter. One drive is designated, by software, as the master drive and the other drive is a slave. The master drive supplies the motors brushless exciter.

General – Please confirm that both channels will be hardwired. Please define performance expectations in the event of the loss of:

- The slave channel
- The master channel

IPSC response

Both drives (channels) will be hardwired. If a slave drive trips the master drive continues to drive the fan, up to the rated horsepower of the drive, based on the control signal form the burner control system. If the master drive trips, the slave drive takes over and supplies excitation and continues to drive the fan up to the up to the rated horsepower of the drive, based on the control signal form the burner control system.

Request for Clarification on Specification and Bidding Documents

IPSC General Comment

The bids are due at 1:00 pm on September 9, 2003. We are disappointed that these questions were not asked earlier in the bid preparation process. Because of the remote location of the plant site it is highly likely that the complete proposals can not be sent by UPS or Fed-Ex and still arrive on time, if they have not been already sent.

We will accept completed Division C documentation sent by fax or e-mail by the 1:00 pm deadline with all of the required reference documentation delivered by Wednesday at 4:30 pm. It is our intent to complete the initial bid review by September 12. Based on the initial review, the three most responsive bidders will be invited to the site on September 16 or 17 to clarify any remaining bid questions and walk down the project site.

TRAINING COURSE SYLLABUS

for

SIGMA SYNCDRIVE MAINTENANCE TRAINING

$\alpha\beta\chi\delta$

COURSE AIM

The aim of the course is to provide the trainee with a working knowledge of Sigma Syncdrive system control concepts, hardware and software architectures, maintenance, fault diagnostic facilities and fault recovery procedures that are to be applied by the first line maintainer.

Where possible every opportunity is taken during the course to re-enforce the theory with comprehensive practical hands on exercises using Sigma Syncdrive equipment.

COURSE DURATION

The duration of the Sigma Syncdrive Maintenance Training course is 4 days.

COURSE PRE-REQUISITES

The trainee must be familiar with general electrical theory and basic safety precautions associated with working on electrical drive control systems. The trainee should be conversant with general drive theory.

COURSE CONTENT

The content of the Sigma Syncdrive Maintenance training course is summarized as follows as appropriate to the supplied system.

1. Description of the Sigma Syncdrive system and hardware architecture, identification and function of the major hardware components that comprise the Sigma Syncdrive system.
2. Familiarisation with the Alstom Syncdrive contract diagrams.
3. Description of the Syncdrive software architecture and concepts of the links application program, ladder application program and software control modules.
4. Description of the basic software configuration of the Syncdrive in conjunction with drive application diagrams.

5. Practical hands on experience in monitoring, editing and fault finding using the diagnostic facilities of the Syncdrive, P80-P (Pilot) programming package and the local keypad in conjunction with drive application diagrams.

6. Practical hands on experience in using the P80-P (Pilot) programming package to reload the Syncdrive user program/firmware.

7. Description of the Sigma history recording package, practical demonstration of collection and interpretation of Syncdrive trip histories using P80-View.

8. Familiarisation with Alstom supplied converter, power boards and power interface boards.

9. Description of the converter cooling system and cooling system fault diagnostics.

The Intermountain Generating Station uses eight (8) 7415/4596 HP motors in an induced draft fan application for two separate generating station. Four of these motors, designed for clockwise rotation, were furnished under Westinghouse Shop Order 1729 AA. The other four motors, designed for counterclockwise rotation, were furnished under Westinghouse Shop Order 1729BA.

Typical motor name plate According to the information shown on Westinghouse motor outline drawings 2136F72 revision number 5 The nameplate data, shown on Westinghouse motor outline drawings is shown below:

Frame Size	B6211890
Motor Type	Synchronous
Enclosure	WPII
Horsepower	7415/4596
Voltage	3876/3876
Power Factor	.9
Full Load Amps	472/538
Hertz	63.6/53.93
Phases	6/3
Service Factor	1.0
Application	AFAC Fan Drive
Load Torque Curve	9255-DE 1001
Load WK^2 LB-FT^2	347,700
Motor WK^2 LB-FT^2	35,000
Poles	8
RPM	954/809
Rotation	CW
Insulation Class	F
Ambient Temperature	45
Altitude Feet	4676
Temperature Rise C	75 C
Breakdown/Pull out Torque	200%
Sound Level	65 dBA @ 1 meter

For six (6) phase operation, both motor windings, energized at rated current.

$P_{in} = \sqrt{3}\, VI \cos\theta$

$P_{in} = \sqrt{3}$ (3876) (472) (2) (0.89)

$Pin = 5740\ kW$

$Pout = \eta\ Pin$

$Pout = 0.97\ (5740\ kW) / (746\ watts / HP)$

$Pout =$

From: "Varga, Tyrone" <vargatyr@tecowestinghouse.com>
To: "'Jon Christiansen (Intermountain Power)'" <jon-c@ipsc.com>
Date: 10/31/2003 10:12:57 AM
Subject: Synchronous Study Information

Jon,

Wanted to let you know that I have sent the information you are looking for to key associates at the factory. I will be in touch with Mr. Craig Elliott over the next couple of days so we can get this information to you ASAP.

If you ever have any questions please do not hesitate to contact me.

Have a good weekend.

Tyrone Varga
TECO-Westinghouse Motor Company
Field Sales Representative - Rocky Mountain / Pacific Northwest Region
2536 Vivian Street, Lakewood, CO 80215
Phone (303) 462-4109 Facsimile (303) 462-4110 Cell (303) 885-8374

Jon attached are my notes from our meeting, please review and issue to ALSTOM.
Don't forget to forward an electronic copy of the spec and any letters you have from ALSTOM so I can revise the spec for contract.

Thanks
John Benz
10/17/03

The return registers are located in Warehouse 4. There are enough to finish both U1 and U2, so make sure the left overs don't get lost. Let me know if you want me to work with the warehouse to have them pulled out.

Bret

>>> Nathan Crop 12/22/2005 6:51:17 AM >>>
Bret,
In preparation for my ID fan stuff this upcoming 2006 outage I need to know if we have on site the ventilation covers.
Nathan

Electrical Engineer
850 West Brush Wellman Road
Delta, UT 84624-9522
Telephone (435) 864-6483
home: (435) 864-8429
Fax (435) 864-6670
E-mail: nathan-c@ipsc.com

>>> Nathan Crop 12/19/2005 5:09:03 PM >>>
Nathan
Order or find out how to order ventilation covers for the duct above the ID fan drives.
Nathan

Electrical Engineer
850 West Brush Wellman Road
Delta, UT 84624-9522
Telephone (435) 864-6483
home: (435) 864-8429
Fax (435) 864-6670
E-mail: nathan-c@ipsc.com

DATA	
Frame Size	B6211690
Motor Type	Synchronous
Enclosure	WPII
Horsepower	7415/4596
Voltage	3800/3076
Power Factor	.9
Full Load Amps	472/538
Hertz	63.6/53.93
Phase	6/3
Service Factor	1.0
Application	AFAC Fan Drive
Ld Torque Curve	9255-DE 1001
Load WK^2 LB-FT^2	347,700
Motor WK^2 LB-FT^2	35,000
Poles	8
RPM	954/809
Rotation	CW
Insul. Class	F
Ambient Temp. °C	45
Altitude Ft.	4676
Temp. Rise °C	75°C
Breakdown/Pull-out Torque	200%
Sound Level	85 dBA @ 1m

Transmittal

Attention Recipient: Please sign and return this form via FAX. Thank you.

FAX: 412-967-7661

Recipient: _____ Date: _____

For same-day shipping, submit completed form and items to be transmitted to Contracts by 2 P.M.

Shipping Method: Hand Delivered by: Delivery By: _____

To: Intermountain Power Service Corporation
850 W. Brush Wellman Road
Delta, UT 84624-9546
Phone: 435-864-6481
Attn: Jon Christensen
Your Ref #: 04-45605 # of Copies: 1 e-mail

From: Stephen P. Klein
ALSTOM Ref #: GD70107
Communication #: AP-IP-T-014
Date: 08/Jan/04
Signed:

Project: Unit No. 1 ID Fans - Adjustable Speed Drive

- [x] For Information
- [ ] For Approval Due Date: [ ] — To maintain shipping schedule, approved drawings or documents must be received by ALSTOM no later than the specified Due Date. Drawings/documents "Approved" or "Approved with Modifications" authorize ALSTOM to proceed with manufacture. Modifications not in the contract or modifications made during or after approval may result in a change in price and/or shipment delay
- [ ] For Construction — The equipment shown in these drawings has been released for construction. Modifications may result in a change in price and/or
- [ ] As Built — These drawings reflect the equipment as it was manufactured and tested in the manufacturing
- [ ] Final — As commissioned/final drawings or documents
- [ ] Other — Explanation:

Note: interim revision being sent as electronic version only

External Distribution

Qty	Type	Additional Copies Sent to	Address	Notes

Internal Distribution — Contracts Masters: scheds. & corres. Dwg. Office Masters: Dwgs. Eng. Masters: Specs., software, manuals

1	transmittal only	Stephen P. Klein	correspondence file	
1	transmittal only	John Bradley	APCI - Pittsburgh	

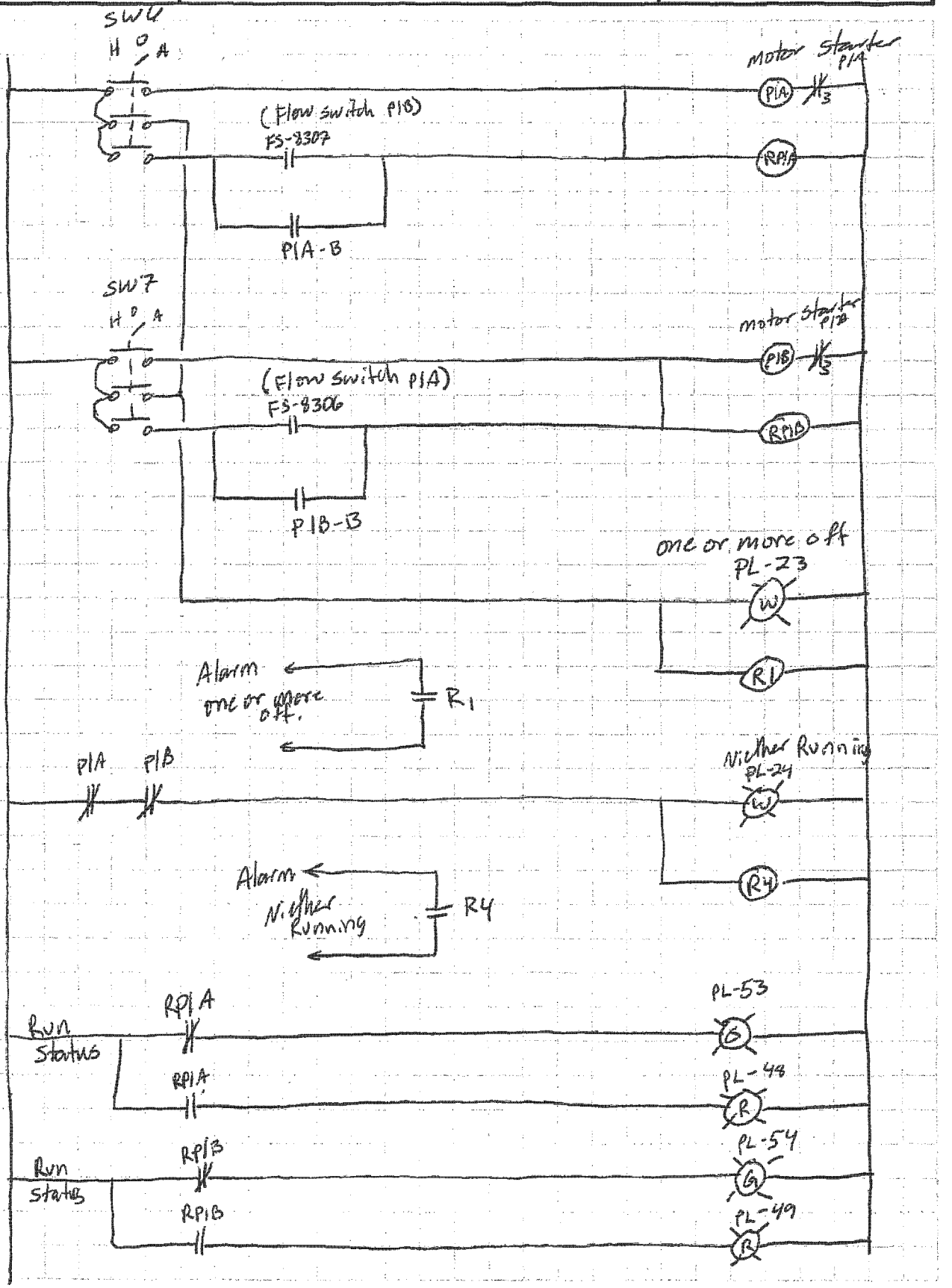
Reference #	Revision #	Description
2000-8100-RR1	E	General Arrangement Drawing
2001-RR1	B	Schematic Drawings

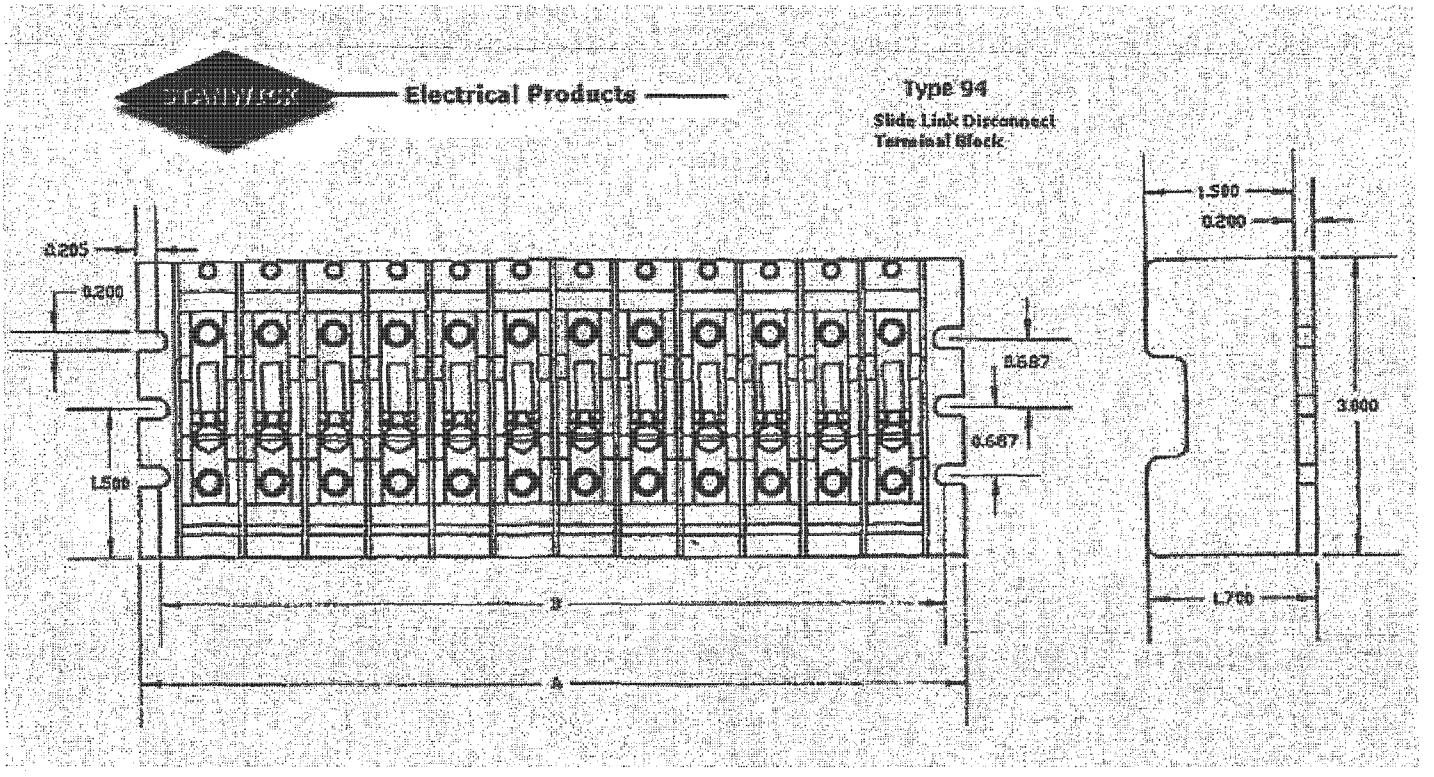
ALSTOM Power Conversion
610 Epsilon Drive
Pittsburgh, PA 15238-2880 USA
Tel.: +1 (412) 967-0765
Fax: +1 (412) 967-7660

IP7015476

CEntry CONSTRUCTORS & ENGINEERS SANDY, UTAH

PROJECT	PROJ NO.
	CALC NO.
SUBJECT A + B	BY DATE
C & D Identical	CHK DATE
	SHEET OF REV





Measurements are +/- 1/16"

Weights rounded to next highest oz. weight

Cat #	Pole	A	B	Weight
94-2	2	2-1/32	1-3/4	4 oz
94-4	4	3-1/4	2-31/32	7 oz
94-6	6	4-15/32	4-3/16	10 oz
94-8	8	5-11/16	5-13/32	12 oz
94-10	10	6-29/32	6-5/8	15 oz
94-12	12	8-1/8	7-27/32	1lb 2 oz
94-13	13	8-47/64	8-29/64	1 lb 3 oz
94-14	14	9-11/32	9-1/16	1 lb 5 oz
94-15	15	9-61/64	9-43/64	1 lb 6 oz
94-16	16	10-9/16	10-9/32	1 lb 8 oz
94-17	17	11-11/64	10-57/64	1 lb 9 oz
94-18	18	11-25/32	11-9/16	1 lb 10 oz
94-19	19	12-25/64	12-7/64	1 lb 12 oz
94-20	20	13	12-23/32	1 lb 13 oz
94-21	21	13-39/64	13-21/64	1 lb 15 oz
94-22	22	14-7/32	13-15/16	2 lb
94-23	23	14-53/64	14-35/64	2 lb 1 oz
94-24	24	15-7/16	15-5/32	2 lb 3 oz

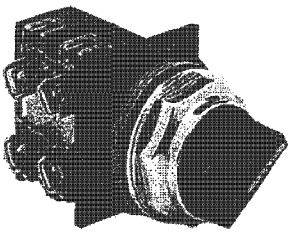
CR104P

Knob Operated
Non-Illuminated
600 Volts Max. AC/DC
10 Amperes Continuous

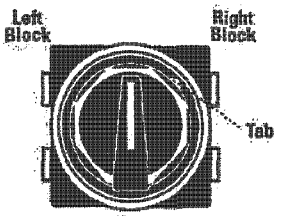
Units are supplied factory-assembled when ordered with contact block.

Product Number and price do not include nameplate. All nameplates must be ordered as a separate item.

Suitable for use in NEMA Type 1, 3, 3R, 4, 4X, 12, and 13 applications, when mounted in enclosures rated for those same applications. For some NEMA Type 4X applications, protective caps will improve corrosion resistance.



Knob-Operated Selector Switch



Contacts viewed from front of panel.

2-Position – Black Knob[1] — GO-10P1

Release Type	2 Position Cam Code	Contact Configuration	Product Number[1]	List Price
Maintained	1	None	CR104PSG21B	$22.20
Maintained	1	1NO-1NC	CR104PSG21B91	$40.20
Maintained	1	2NO-2NC	CR104PSG21B92	$58.20
Spring Return L → C	2	None	CR104PSG12B	$34.20
Spring Return L → C	2	1NO-1NC	CR104PSG12B91	$52.20
Spring Return L → C	2	2NO-2NC	CR104PSG12B92	$70.20
Spring Return R → C	3	None	CR104PSG63B	$34.20
Spring Return R → C	3	1NO-1NC	CR104PSG63B91	$52.20
Spring Return R → C	3	2NO-2NC	CR104PSG63B92	$70.20

[1]*To order knob in a color other than black, replace the "B" in listed Product Numbers with E (Yellow), G (Green), L (Blue), or R (Red).*

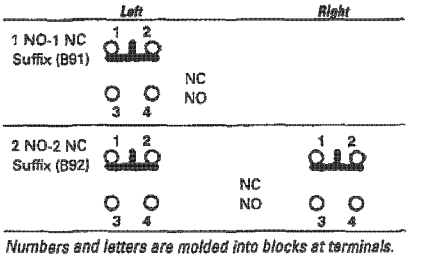
2-Position Selector Switches – Non-Illuminated

Operator Position				Cam #1		Cam #2		Cam #3	
				Type of Contact Block	Mounting Location Left/Right	Type of Contact Block	Mounting Location Left/Right	Type of Contact Block	Mounting Location Left/Right
Contact State	O	–	X	NO	L or R	–		–	
	X	–	O	NC	L or R	–		–	
	X	O	–	–		NO	L or R	–	
	O	X	–	–		NC	L or R	–	
	–	O	X	–		–		NO	L or R
	–	X	O	–		–		NC	L or R

– : This position is nonexistent or is a "pass through".
In the product number of a selector switch, the cam is identified by the fifth figure after the "104".
Example: CR104PSG2 1 B, the cam number is 1.

Schematic Diagrams – Factory Forms

Contacts viewed from front of panel



Numbers and letters are molded into blocks at terminals.

3-Position – Black Knob[1] – Maintained — GO-10P1

Release Type	3 Position Cam Code	Contact Configuration	Product Number[1]	List Price
Maintained	4	None	CR104PSG34B	$22.20
Maintained	4	1NO-1NC	CR104PSG34B91	$40.20
Maintained	4	2NO-2NC	CR104PSG34B92	$58.20
Maintained	2	None	CR104PSG32B	$22.20
Maintained	2	1NO-1NC	CR104PSG32B91	$40.20
Maintained	2	2NO-2NC	CR104PSG32B92	$58.20
Maintained	3	None	CR104PSG33B	$22.20
Maintained	3	1NO-1NC	CR104PSG33B91	$40.20
Maintained	3	2NO-2NC	CR104PSG33B92	$58.20
Maintained	5	None	CR104PSG35B	$22.20
Maintained	5	2NO-2NC	CR104PSG35B92	$58.20
Maintained	6	None	CR104PSG36B	$22.20
Maintained	6	2NO-2NC	CR104PSG36B92	$58.20

3-Position – Black Knob[1] – Spring Return L → C — GO-10P1

Release Type	3 Position Cam Code	Contact Configuration	Product Number[1]	List Price
Spring Return L → C	4	None	CR104PSG74B	$34.20
Spring Return L → C	4	1NO-1NC	CR104PSG74B91	$52.20
Spring Return L → C	4	2NO-2NC	CR104PSG74B92	$70.20
Spring Return L → C	2	None	CR104PSG72B	$34.20
Spring Return L → C	2	1NO-1NC	CR104PSG72B91	$52.20
Spring Return L → C	2	2NO-2NC	CR104PSG72B92	$70.20
Spring Return L → C	3	None	CR104PSG73B	$34.20
Spring Return L → C	3	1NO-1NC	CR104PSG73B91	$52.20
Spring Return L → C	3	2NO-2NC	CR104PSG73B92	$70.20
Spring Return L → C	5	None	CR104PSG75B	$34.20
Spring Return L → C	5	2NO-2NC	CR104PSG75B92	$70.20
Spring Return L → C	6	None	CR104PSG76B	$34.20
Spring Return L → C	6	2NO-2NC	CR104PSG76B92	$70.20

[1]*To order knob in a color other than black, replace the "B" in listed Product Numbers with E (Yellow), G (Green), L (Blue), or R (Red).*

3-Position Selector Switches – Non-Illuminated

Operator Position				Cam #4		Cam #2		Cam #3		Cam #5		Cam #6	
				Type of Contact Block	Mounting Location Left/Right	Type of Contact Block	Mounting Location Left/Right	Type of Contact Block	Mounting Location Left/Right	Type of Contact Block	Mounting Location Left/Right	Type of Contact Block	Mounting Location Left/Right
Contact State	O	O	X	NO	L or R	–	–	NO	L or R	NO	L or R	NO	Left
	O	X	O	–	–	NC	L or R	NC	L or R	NC	Right	–	–
	X	O	O	NC	L or R	NO	L or R	–	–	NC	Left	NO	Right
	X	X	O	–	–	–	–	–	–	–	–	NC	Left
	O	X	X	–	–	–	–	–	–	–	–	NC	Right

In the product number of a selector switch, the cam is identified by the fifth figure after the "104".
Example: CR104PSG2 1 B, the cam number is 1.

Publications and Reference: *See Section 15 for a complete list of additional product-related publications*

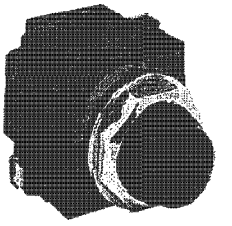
CR104P

600 Volts Max. AC/DC
10 Amperes Continuous

Suitable for use in NEMA Types 1, 3, 3R, 4, 4X, 12, and 13 applications when mounted in enclosures rates for those same applications. For some NEMA Type 4X applications, protective caps will improve corrosion resistance.

Standard Indicating Lights — GD-10P1

Power Supply Type	Supply Voltage	Lamp Type	Product Number[1]	List Price
Transformer	120V 50/60 Hz	Incand., 6V, #755	CR104PLG32*	$64.20
Transformer	200-208V 60 Hz	Incand., 6V, #755	CR104PLG3A*	$64.20
Transformer	240V 50/60 Hz	Incand., 6V, #755	CR104PLG33*	$64.20
Transformer	277V 60 Hz	Incand., 6V, #755	CR104PLG3B*	$64.20
Transformer	347V 60 Hz	Incand., 6V, #755	CR104PLG3C*	$64.20
Transformer	480V 50/60 Hz	Incand., 6V, #755	CR104PLG34*	$64.20
Transformer	600V 50/60 Hz	Incand., 6V, #755	CR104PLG35*	$64.20
Full Voltage	6V 50/60 Hz	Incand., 6V, #755	CR104PLG16*	$52.50
Full Voltage	12V 50/60 Hz	Incand., 12V, #756	CR104PLG17*	$52.50
Full Voltage	24V 50/60 Hz	Incand., 24V, #1819	CR104PLG18*	$52.50
Full Voltage	120V 50/60 Hz	Incand., 130V	CR104PLG22*	$52.50
Resistor	120V 50/60 Hz	Incand., 60V	CR104PLG42*	$52.50
Resistor	240V 50/60 Hz	Incand., 130V	CR104PLG43*	$52.50
Transformer	120V 50/60 Hz	LED, 6V	CR104PLG92*	$82.20
Transformer	200-208V 60 Hz	LED, 6V	CR104PLG9A*	$82.20
Transformer	240V 50/60 Hz	LED, 6V	CR104PLG93*	$82.20
Transformer	277V 60 Hz	LED, 6V	CR104PLG9B*	$82.20
Transformer	347V 60 Hz	LED, 6V	CR104PLG9C*	$82.20
Transformer	480V 50/60 Hz	LED, 6V	CR104PLG94*	$82.20
Transformer	600V 50/60 Hz	LED, 6V	CR104PLG95*	$82.20
Full Voltage	6 VAC/DC	LED, 6V	CR104PLG86*	$70.20
Full Voltage	12 VAC/DC	LED, 12V	CR104PLG87*	$70.20
Full Voltage	24 VAC/DC	LED, 24V	CR104PLG88*	$70.20
Full Voltage	120 VAC/DC	LED, 120V	CR104PLG82*	$70.20
Transformer, Flashing	120V 50/60 Hz	Incand., 6V, #267 Flasher	CR104PLG62*	$67.20
Transformer, Flashing	200-208V 60 Hz	Incand., 6V, #267 Flasher	CR104PLG6A*	$67.20
Transformer, Flashing	240V 50/60 Hz	Incand., 6V, #267 Flasher	CR104PLG63*	$67.20
Transformer, Flashing	277V 60 Hz	Incand., 6V, #267 Flasher	CR104PLG6B*	$67.20
Transformer, Flashing	347V 60 Hz	Incand., 6V, #267 Flasher	CR104PLG6C*	$67.20
Transformer, Flashing	480V 50/60 Hz	Incand., 6V, #267 Flasher	CR104PLG64*	$67.20
Transformer, Flashing	600V 50/60 Hz	Incand., 6V, #267 Flasher	CR104PLG65*	$67.20
Full Voltage, Flashing	6V 50/60 Hz	Incand., 6V, #267 Flasher	CR104PLG56*	$70.20
Full Voltage	120V	Neon, 120V, #NE51H-R	CR104PLG72*	$55.20

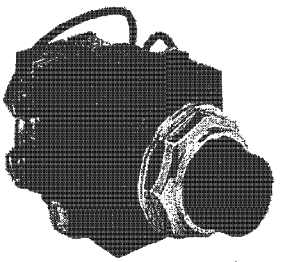


Standard

Push-to-Test Indicating Lights — GD-10P1

Power Supply Type	Supply Voltage	Lamp Type	Product Number[1]	List Price
Transformer	120V 50/60 Hz	Incand., 6V, #755	CR104PLT32*	$82.20
Transformer	200-208V 60 Hz	Incand., 6V, #755	CR104PLT3A*	$82.20
Transformer	240V 50/60 Hz	Incand., 6V, #755	CR104PLT33*	$82.20
Transformer	277V 60 Hz	Incand., 6V, #755	CR104PLT3B*	$82.20
Transformer	347V 60 Hz	Incand., 6V, #755	CR104PLT3C*	$82.20
Transformer	480V 50/60 Hz	Incand., 6V, #755	CR104PLT34*	$82.20
Transformer	600V 50/60 Hz	Incand., 6V, #755	CR104PLT35*	$82.20
Full Voltage	6V 50/60 Hz	Incand., 6V, #755	CR104PLT16*	$70.20
Full Voltage	12V 50/60 Hz	Incand., 12V, #756	CR104PLT17*	$70.20
Full Voltage	24V 50/60 Hz	Incand., 24V, #1819	CR104PLT18*	$70.20
Full Voltage	120V 50/60 Hz	Incand., 130V	CR104PLT22*	$70.20
Resistor	120V 50/60 Hz	Incand., 60V	CR104PLT42*	$70.20
Resistor	240V 50/60 Hz	Incand., 130V	CR104PLT43*	$70.20
Transformer	120V 50/60 Hz	LED, 6V	CR104PLT92*	$100.20
Transformer	200-208V 60 Hz	LED, 6V	CR104PLT9A*	$100.20
Transformer	240V 50/60 Hz	LED, 6V	CR104PLT93*	$100.20
Transformer	277V 60 Hz	LED, 6V	CR104PLT9B*	$100.20
Transformer	347V 60 Hz	LED, 6V	CR104PLT9C*	$100.20
Transformer	480V 50/60 Hz	LED, 6V	CR104PLT94*	$100.20
Transformer	600V 50/60 Hz	LED, 6V	CR104PLT95*	$100.20
Full Voltage	6 VAC/DC	LED, 6V	CR104PLT86*	$88.20
Full Voltage	12 VAC/DC	LED, 12V	CR104PLT87*	$88.20
Full Voltage	24 VAC/DC	LED, 24V	CR104PLT88*	$88.20
Full Voltage	120 VAC/DC	LED, 120V	CR104PLT82*	$88.20
Transformer, Flashing	120V 50/60 Hz	Incand., 6V, #267 Flasher	CR104PLT62*	$85.20
Transformer, Flashing	200-208V 60 Hz	Incand., 6V, #267 Flasher	CR104PLT6A*	$85.20
Transformer, Flashing	240V 50/60 Hz	Incand., 6V, #267 Flasher	CR104PLT63*	$85.20
Transformer, Flashing	277V 60 Hz	Incand., 6V, #267 Flasher	CR104PLT6B*	$85.20
Transformer, Flashing	347V 60 Hz	Incand., 6V, #267 Flasher	CR104PLT6C*	$85.20
Transformer, Flashing	480V 50/60 Hz	Incand., 6V, #267 Flasher	CR104PLT64*	$85.20
Transformer, Flashing	600V 50/60 Hz	Incand., 6V, #267 Flasher	CR104PLT65*	$85.20
Full Voltage, Flashing	6V 50/60 Hz	Incand., 6V, #267 Flasher	CR104PLT56*	$88.20
Full Voltage	120V	Neon, 120V, #NE51H-R	CR104PLT72*	$73.20

[1]*Replace asterisk (*) in product number with letter from table on right.*



Push-to-Test

Lens Colors Available[2]

Color	Insert in place of asterisk (*)
No Lens	A[2,3,4]
Clear[4]	C[3]
Yellow	E[4]
Green	G[4]
Blue	L[4]
Amber	M
Red	R
White	W

[2]*Subtract $4.20 from list price with no lens.*
[3]*Not suitable for use with LED.*
[4]*Not suitable for use with NEON light.*

Publications and Reference: *See Section 15 for a complete list of additional product-related publications*
Lamps: *See page 7-35*

Nameplates: *See pages 7-40 to 7-41*
Technical Data: *See pages 7-56 to 7-57*
Drilling Plans and Dimensions: *See page 7-57*

Plug-in Relay

Class 8501-Type K

8501K relays are designed for multipole switching applications at 240 volts or lower. These relays have industry standard wiring and pin arrangements which allows for their use as replacements for many similar relays without wiring or hardware modifications.

* 10 or 15 A versions * DPDT or 3PDT * Manual operator/red pilot light options	* Horsepower rated * DPDT latching relay * AC or DC operation

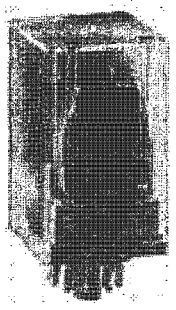
Type KF [a] —Flange Mounted—Spade Terminals

	Input Voltage	Contact Arrangement	Options	Type	Price
	AC 50/60 Hz	DPDT	None Available	KF12[b]	$16.40
		3PDT		KF13[b]	17.80
	DC	DPDT	None Available	KFD12[b]	16.40
		3PDT		KFD13[b]	17.80

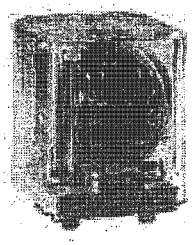
[a] Socket is not required with Type KF relays.

Type KL—Latching Relay—Spade Terminals

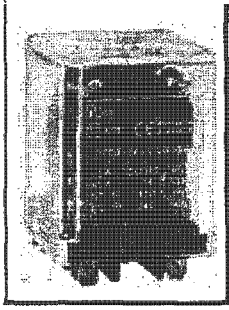
	Input Voltage	Contact Arrangement	Options	Type	Price
	AC 50/60 Hz	DPDT	None Available	KL12[b]	$30.

	AC 50/60 Hz	DPDT	None	KP12[b]	$26.00
		DPDT	Pilot Light	KP12P14[b]	30.00
		3PDT	None	KP13[b]	31.50
		3PDT	Pilot Light	KP13P14[b]	35.50
	DC	DPDT	None	KPD12[b]	26.00
		DPDT	Pilot Light	KPD12P14[b]	30.00
		3PDT	None	KPD13[b]	31.50
		3PDT	Pilot Light	KPD13P14[b]	35.50

Type KU—Spade Terminals

	Input Voltage	Contact Arrangement	Options	Type	Price
	AC 50/60 Hz	DPDT	None	KU12[b]	$15.10
		DPDT	Manual Operator	KU12M1[b]	17.80
		DPDT	Pilot Light	KU12P14[b]	19.10
		DPDT	Manual Operator and Pilot Light	KU12M1P14[b]	20.50
		3PDT	None	KU13[b]	16.40
		3PDT	Manual Operator	KU13M1[b]	19.10
		3PDT	Pilot Light	KU13P14[b]	20.50
		3PDT	Manual Operator and Pilot Light	KU13M1P14[b]	23.30
	DC	DPDT	None	KUD12[b]	15.10
		DPDT	Manual Operator	KUD12M1[b]	17.80
		DPDT	Pilot Light	KUD12P14[b]	19.10
		DPDT	Manual Operator and Pilot Light	KUD12M1P14[b]	20.50
		3PDT	None	KUD13[b]	16.40
		3PDT	Manual Operator	KUD13M1[b]	19.10
		3PDT	Pilot Light	KUD13P14[b]	20.50
		3PDT	Manual Operator and Pilot Light	KUD13M1P14[b]	23.30

Pilot Light Option—Available on Types KP and KU. Internal pilot lights are available in both AC and DC versions for

	DC	DPDT	None Available	KLD12[b]	30.

Stocked Relays

Type	AC Voltage 50/60 Hz					Type	DC Voltage					
	6	12	24	120	240		6	12	24	48	110	125
Voltage Codes	**V35**	**V36**	**V14**	**V20**	**V24**	**Voltage Codes**	**V50**	**V51**	**V53**	**V56**	**V60**	**V63**
KP12	S	S	S	S	S	KPD12	S	S	S	S	S	S
KP12P14		S	S	S	S	KPD12P14		S	S		S	S
KP13		S	S	S	S	KPD13		S	S	S	S	S
KP13P14			S	S	S	KPD13P14			S			S
KU12		S	S	S	S	KUD12		S	S			
KU12M1						KUD12M1			S			
KU12P14			S	S		KUD12P14						
KU12M1P14			S	S	S	KUD12M1P14			S			
KU13		S	S	S	S	KUD13		S	S		S	S
KU13M1						KUD13M1			S			
KU13P14			S	S		KUD13P14						
KU13M1P14			S	S	S	KUD13M1P14			S		S	S
KF12			S	S	S	KFD12		S	S			
KF13			S	S		KFD13			S			
KL12			S	S	S	KLD12		S	S			

S—Stocked
Factory Order items require a minimum order quantity of 25 and have a lead time of 12 weeks.
[b] Voltage code must be specified to order this product. Refer to standard voltage codes listed in the Stocked Relays table above and insert as shown in How To Order.

Type KP—Tubular Terminals

	Input Voltage	Contact Arrangement	Options	Type	Price